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of the

AMERICAN ASSOCIATION

of

NURSE ANESTHETISTS

MAY

1940

VOLUME 8 NUMBER 2

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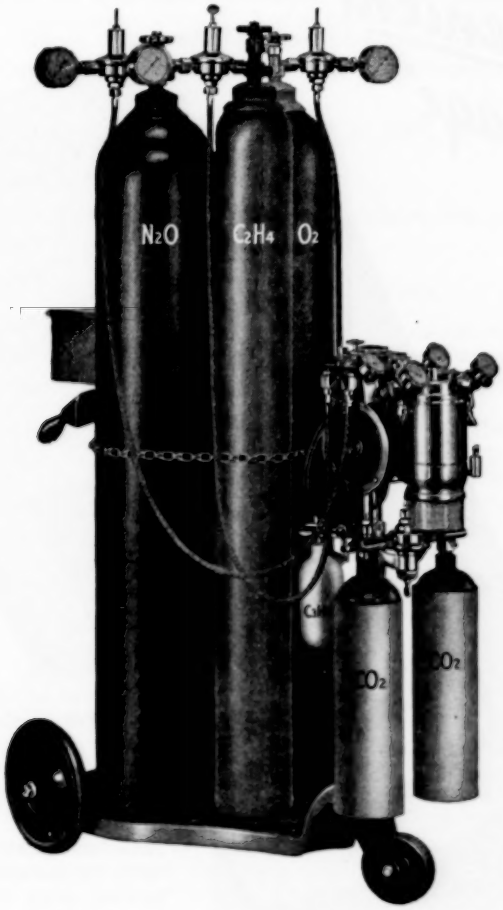

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Publishing Committee: Gertrude L. Fife, Chairman; Jewelle Fink, Harriet L. Aberg, Rose G. Donovan.

Entered as second class matter February 6, 1937, at the Postoffice at Cleveland, Ohio, under the Act of March 3, 1879.

Published quarterly; subscription price—members 50¢ per year; nonmembers, $1.00 per year.

EDITORIAL COMMUNICATIONS

The Bulletin invites concise, original articles on anesthesia. Description of new technics and methods are welcomed. Articles are accepted for publication with the understanding that they are contributed solely to the Bulletin of the American Association of Nurse Anesthetists.

Manuscripts submitted for publication may be sent to Gertrude L. Fife, University Hospitals, Cleveland, Ohio.

The American Association of Nurse Anesthetists does not hold itself responsible for any statements or opinions expressed by any contributor in any article published in its columns.

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BUSINESS COMMUNICATIONS

All communications in regard to advertising, subscriptions, change of address, et cetera, should be addressed to the Chairman of the Publishing Committee, 2065 Adelbert Road, Cleveland, Ohio.

The Chairman of the Publishing Committee should be advised of change of address about fifteen days before the date of issue, with both old and new addresses given.

Because of the second class postal rates in effect the Postoffice does not forward the Bulletin unless extra postage is sent to the Postoffice to which the Bulletin was originally mailed.

Non-Receipt of Copies. — Complaints of non-receipt of copies should be made within ten days following date of publication, otherwise the supply is likely to be exhausted.

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ANESTHESIA IN ABDOMINAL SURGERY, PARTICULARLY FOR OPERATIONS ON THE COLON

HENRY W. CAVE, M.D.

Roosevelt Hospital, New York, N. Y.

Read at the sixth annual convention of the Mid-South Post Graduate Nurse Anesthetists' Assembly, held in Memphis, Tenn., February 14-15, 1940.

Anesthesia plays an essential and important role in any abdominal operation. Complete relaxation is necessary. Every safeguard should be employed in the prevention of postoperative pneumonia, which so frequently follows operative maneuvers in the upper abdomen. Since the introduction of anesthesia there has been an ever increasing and enthusiastic endeavour to reduce to a bare minimum dangers to the life of the individual; undoubtedly, advance has been made. New agents and new methods of administering anesthetics are constantly brought forward, all based upon the principles of satisfactory relaxation and safety.

Careful thought should be given to what is the proper anesthesia for each patient, and sound judgment should never be replaced by routine methods which so frequently lead to disaster. Frequently, anesthetics have to be administered to patients in whom no organic lesion has been found even after careful examination; the so-called "unknown" poor risk patient is probably responsible for some of our sudden deaths under anesthesia.

At the outset let it be clearly understood that of all anesthetics and all methods I consider open drop ether the safest and most satisfactory. It is due to the striving for perfection that far-seeing and intelligent anesthetists are endeavoring to give satisfactory results with the greatest percentage of safety; thus new agents and new methods are rapidly being brought to us.

In abdominal surgery where the deeper reflexes are involved in the operation, it is essential that the muscles be well relaxed so that the surgeon can do his work quickly and with as little difficulty as possible. Avoidance of severe traction on the muscles, which is always necessary with a rigid abdominal wall, gentle handling of the tissues and a minimum amount of pull on the mesentery are factors which lessen the degree of shock for the patient and so contribute to his safety. Relaxing anesthetics and methods are thought to have more harmful effects on the patient than milder anesthetics, but when the operation is one which is technically difficult, such as a radical operation on the colon, the importance of good relaxation far outweighs whatever harm may come to the patient from the relaxing anesthetic. It is better judgment to have good muscular relaxation at the expense of some possible harm to the patient rather than subject him to an exhausting procedure which may harm him far more because of unsatisfactory anesthesia.

Ether is the oldest anesthetic; it has stood the test of time and is still held in high regard by many surgeons and anesthetists. It combines the important advantages of producing good relaxation, of being easily controlled and of having a wide margin of safety between the anesthetic dose and the lethal dose. Its chief disadvantages are that it produces a

certain amount of acidosis due to its disturbance of the body metabolism; its administration is frequently followed by nausea and vomiting, and it is irritating to the kidneys and lungs.

In a recent statistical study of anesthesia at the Roosevelt Hospital certain data is available, and from this we are able to draw certain conclusions which are unquestionably illuminating and helpful. In this series of one hundred cases there were seven postoperative pulmonary complications, all following the use of ether. In five cases ether alone was used, in one it was used to supplement nitrous oxide and in one instance to supplement cyclopropane. In the latter two cases the patients died from pulmonary emboli on the tenth and twelfth days respectively. Two of the other patients recovered satisfactorily, but three died; one from a terminal bronchopneumonia following an abdomino-perineal resection of the rectum with an acute purulent general peritonitis; one from a bronchopneumonia following abdomino-perineal resection in a woman who was very obese; and one from a lobar pneumonia in a patient in whom it was necessary to remove part of the transverse colon and part of the stomach and jejunum because of extensive carcinoma.

Unquestionably spinal anesthesia offers the best relaxation and best operative conditions of any method we have used thus far in abdominal surgery. However, there is a wide divergence of opinion as regards the danger and safety of spinal anesthesia. There are those who minimize the risk and use this method for all operations below the diaphragm, while others feel that there is a definite risk and use spinal anesthesia only in selected cases. Results of some investigators would seem to indicate a higher immediate mortality with this form of anesthesia than with most others. Henson in a survey covering the five boroughs of New York City during the four years from 1933 to 1936 inclusive reported 398 deaths on the operating table, of which 193 appeared to be definitely due to the anesthesia. The approximate death rate for spinal anesthesia was found to be 42 per 100,000, as against 25 for chloroform and only 15 for ether and cyclopropane.

Because of the satisfactory operative conditions which spinal anesthesia affords in abdominal surgery we feel that it is well worth while to assume the risk with a patient in good general condition. With patients in poor condition and where the operation is likely to be a long, exhaustive procedure, it is questionable whether this method is justifiable unless it will enable the surgeon to perform the operation more expeditiously than with some other anesthesia, or unless it is an emergency procedure in the presence of a respiratory infection where the use of inhalation anesthesia might result in severe postoperative pulmonary complication.

One of the serious disadvantages of spinal anesthesia is the fall in blood pressure, which may be so severe as to result in the sudden death of the patient. One such case occurred at the hospital in a woman of forty who was to undergo a pelvic operation. She was given 2 cc. of spinocaine in the third lumbar space and was being prepared for operation when it was found that no blood pressure could be obtained. There had been some previous difficulty with the sphygmomanometer and the anesthetist suggested that it be tried on his arm, as the patient appeared to be in perfectly good condition,

with no respiratory embarrassment and the color was unchanged. It required only a few minutes to determine that the sphygmomanometer was in good order but when they examined the patient again she was found to be dead. The fact that no blood pressure could be obtained probably should have been a warning of circulatory collapse, although Labat, who was considered an authority on spinal anesthesia in this country until his death a few years ago, paid no attention to the blood pressure and often made the statement that he did not worry if the patient's blood pressure dropped to zero.

Another disadvantage of spinal anesthesia is the psychic effect on some patients who have a horror of knowing anything about the operation. Unless contraindicated, general anesthesia is perhaps more satisfactory for such patients, although this psychic disturbance can largely be avoided by use of one, or more, of the drugs now available for premedication. A combination that we have found satisfactory consists of 3 grains of nembutal one hour and a half before operation followed in about one hour by morphine grain 1/6 and scopolamine grain 1/150. Often these patients will doze through a radical operation on the stomach, or colon, without any memory of their experience even though they may seem to complain at times of some discomfort. Frequently we have the patient rebreathe oxygen during the operation, which not only helps his general condition but also seems to improve the anesthesia. If it seems necessary we employ a supplemental gas-oxygen anesthesia. In this way we protect the patient against any psychic reaction which might add to the shock of the operation, and obtain the desired muscular relaxation which facilitates the work of the surgeon. If the spinal anesthesia has to be reinforced for any reason, the gas-oxygen anesthesia can always be deepened before the patient's reflexes have been so badly disturbed that the inhalation anesthesia has to be pushed to a much greater depth than would otherwise be necessary.

Spinal anesthesia was our method of choice in 15 per cent of this series of one hundred cases, and with very satisfactory results. Novocain is used for short or emergency procedures lasting up to forty-five minutes, while for longer procedures we always use pontocain, or nupercain. The longest operation under spinal was a subtotal colectomy lasting two hours and fifty-five minutes, with perfect anesthesia and only a moderate fall in blood pressure.

We have thought it advisable to avoid spinal anesthesia wherever the systolic blood pressure is below 100 millimeters of mercury, or where there is a marked hypertension and any serious disturbance of the heart and circulatory system. Many of the cases operated upon late in life, with probably some cardiac damage, react poorly to spinal anesthesia and violent circulatory changes should be avoided for fear of putting too much load on the heart. We also use it with great caution in those individuals who are extremely anemic as is often the case with patients suffering from chronic ulcerative colitis and carcinoma of the large intestine or rectum. A lowering of the blood pressure causes a disturbed function of all the organs of the body, especially the heart, and a depression of the central nervous system resulting from anemia of the brain with anoxia of the brain cells.

A steady drop of blood pressure is always a warning that surgical shock

is threatening. Whenever this occurs, we immediately start an infusion of saline with usually spectacular results. In many cases where we anticipate such a fall in blood pressure we start a slow infusion at the beginning of the operation, ending with a transfusion on the table. In this way we usually avoid any severe drop in blood pressure and the patient leaves the operating room in fairly good condition considering the length and seriousness of the operation.

In the past four years we have had an unusual surgical experience with chronic intractable ulcerative colitis. This disease is a disease of the young and early adult life. As our experience grows, I am convinced that we can more frequently employ spinal anesthesia during the stage of subtotal colectomy. The mobilization of the caecal head and division of the splenophrenic-colic ligament can be made easier for the surgeon and less trying for the patient if spinal anesthesia is utilized.

Nitrous oxide does not produce sufficient muscular relaxation for abdominal surgery unless supplemented by another anesthetic, or unless pushed to a dangerous depth. It is free from harmful effects on body tissues when combined with a proper amount of oxygen but, since its effect is produced by its interference with oxygenation of the tissues, when pushed to extreme depth anoxia of the tissues results with consequent danger to the patient. Combined with varying amounts of ether it was used in 15 per cent of our cases with generally satisfactory results.

Ethylene, which has distinct advantages over nitrous oxide in permitting the use of a higher percentage of oxygen and in producing a greater amount of relaxation, has not been in use at the Roosevelt Hospital since about 1930, when an explosion occurred in a New York hospital.

Cyclopropane alone, or in combination with other agents, was used in 30 per cent of this series of cases. The abundance of oxygen which can be used with this gas is particularly advantageous for patients suffering from a chronic, debilitating disease such as ulcerative colitis and carcinoma of the large bowel, or rectum. The relaxation was generally good, especially when cyclopropane was supplemented by small amounts of ether, or when used in combination with avertin. Lack of harmful effects on the body tissues, the abundance of oxygen which could be used and the reasonably good relaxation obtained with this gas, increased its popularity with us in our abdominal procedures until we were unfortunate in having two explosions at the hospital. In both cases cyclopropane alone was being used; so it was decided to abandon its use at least temporarily. One of the explosions was definitely due to the presence of an electrical appliance and fortunately resulted only in damage to the apparatus. In the other case, however, static electricity was responsible for the explosion which resulted in the death of the patient.

Although ether combined with air or oxygen forms a highly explosive mixture, the explosion hazard was not recognized as a serious problem until after the introduction of ethylene in 1923. Since the introduction of cyclopropane it has been the subject of very careful investigation. A committee was appointed by the American Society of Anesthetists, Inc., to obtain statistical data on the number of explosions which have occurred with various anesthetic agents and it may be of interest to report the results of their investigations cover-

ing the period from 1925 to March 1939:

TABLE

	Total Number	Total Deaths	Explosion due to Static	Deaths due to Static
1. Ether-air	23	2	2	0
2. Ether-oxygen	10	3	4	0
3. (Nitrous oxide) (Oxygen-ether)	19	5	9	5
4. Ethylene-oxygen*	16	5	9	5
5. Cyclopropane*	9	3	5	2

* These cases include those in which ether or other agents were added.

Their report concluded with the statement that "considering the fact that the above table represents the accidents occurring over the entire United States of America for the past 15 years during which time these agents have been administered hundreds of thousands of times, the accidents are relatively infinitesimal in number and most of them were due to correctible technical errors."

The use of avertin combined with other narcotics in such a way that no one agent could produce its deleterious action to more than a slight degree has given us gratifying results and was our choice of procedure in 16 per cent of these cases. With the use of a small dose of avertin as a basal anesthetic reinforced by gas, or a small amount of ether, or a local anesthetic, we have had the good effects of avertin with a pleasant induction of anesthesia, muscular relaxation more easily obtained, with few unpleasant after-effects even with the use of ether and without serious depression of the circulation, or respiration. Many patients who have always been terrified by the thought of having to take an anesthetic now say they will never again be afraid. This is extremely helpful for patients who are faced with a two, three, or four stage operation as are many patients suffering from chronic ulcerative colitis, or carcinoma of the large bowel.

Chloroform is a good relaxing agent, but its use is generally condemned because of its toxic action on the heart and nervous system as well as its damaging effect on the liver. It was used in two of our cases, one for a caecostomy operation to relieve acute intestinal obstruction in an extremely nervous woman of seventy-six, who insisted upon being put to sleep. Because of extreme distension, embarrassing the respirations, it was decided to use the open drop method and chloroform was employed to avoid any irritation of the lungs. In one other case a very small amount of chloroform was used for induction of anesthesia to be followed by ether. In neither case were there any ill effects.

During a radical operation on the colon, or a one-stage abdominoperineal resection of the rectum there is always the possibility that a severe state of shock may develop due to trauma to the tissues caused by traction on the muscles and mesentery, particularly if relaxation is not complete, and a long surgical procedure with its inevitable loss of a certain amount of blood in a patient who is already weakened by the disease. Other factors are loss of heat, sweating, the depressing effect of the anesthetic, as well as the preoperative condition of the patient. Of these one hundred cases sixty-one showed no appreciable shock at all, in seventeen it was slight, in sixteen moderate and in six it was quite severe. The degree of shock did not seem to have any relation to the anesthetic, or method of anesthesia used, since it occurred with spinal, with cyclopropane and with ether, or its combinations.

In every case it is important to lighten the anesthesia as much as possible toward the end of the operation so that there is an early return of the cough reflex with good pulmonary ventilation. The patient should be turned from side to side at frequent intervals with the liberal use of oxygen inhalations whenever the patient's condition seems to demand it, and morphine for the relief of pain is of more value than any possible harm it may do to the patient's respirations.

Although this presentation has dealt with anesthesia relating primarily to operations upon the colon, I am reluctant to close without commenting upon anesthesia in gallbladder surgery and anesthesia in surgery of the stomach. We have for the past six years made it a practice to use avertin in the good risk gallbladder patients supplementing it with nitrous oxide and with as little ether as possible. Further, we have made it a practice with all patients suffering from gallbladder disease except the acute fulminating type, that they be given a three-day preoperative preparation consisting of abundant intravenous glucose solution, high carbohydrate diet and a thorough cleansing of the large intestine; with these preparatory measures and the use of avertin, nitrous oxide and ether, postoperative convalescence in these individuals has been most satisfactory.

Of late we have utilized the Howard-Jones dilution of nupercaine in operating upon the stomach, particularly if subtotal gastrectomy is contemplated. In prolonged operative maneuvers upon the stomach fewer postoperative complications result with the use of spinal anesthesia than with any other method.

Tennessee Anesthetists at Southeastern Meeting, Edgewater Park

ANESTHESIA FROM A UROLOGIST'S POINT OF VIEW

GEORGE GILBERT SMITH, M.D.
Boston, Mass.

Read at the sixth annual meeting of the Mid-South Post Graduate Nurse Anesthetists' Assembly, held in Memphis, Tenn., February 14-15, 1940.

In thinking over what I might say to you, who know so much more about anesthesia than I do, I found myself asking why there should be any difference between the viewpoint of the urologist and that of any other type of surgeon. Yet there are such differences, I am sure. The urologist operates upon many patients in whom the problems related to anesthesia are the same as the problems encountered in general surgery. Operations upon the external genitalia, for example, offer no particular hazards. The majority of urological operations, however, have to do with the kidneys or the prostate; these operations, and operations upon the bladder as well, tend to disturb the renal function more than do the operations of general surgery.

The first difference, therefore, has to do with the preservation of renal activity. The function of the kidney may be influenced by several factors. One of minor importance, probably, but one which ought to be considered, has to do with the chilling of the body surface. We know that in kidneys already diseased, an exacerbation of the disease process, whether it be infectious or of the nephritic type, may be caused by exposure to cold. In guarding against this effect during operation or immediately afterwards, the anesthetist can be of the greatest help.

The effect upon the kidney of the anesthetic agent itself is minimized today. According to Cushny, ether is eliminated almost entirely through the lungs; this author does not appear to believe that ether when used for anesthesia has any deleterious effect upon the kidneys. With the modern methods of administering ether in conjunction with nitrous oxide and oxygen, only small amounts of ether, perhaps a few drachms, are used. Thirty years ago, when I used to eke out a precarious livelihood by giving an occasional anesthetic, it was not unusual to consume the contents of three eight ounce cans during an hour's operation. Much of the ether, it is true, never reached the goal it was intended for, but permeated the entire operating room. The surgeon's breath told the story of his morning's work throughout his afternoon office hours, and perhaps called forth a grimace from his loving spouse when he greeted her at the end of the day. Even under such liberal use of ether, it was difficult to know whether the renal suppression was due to the drug itself, or to concomitant factors such as dehydration and lowered blood pressure.

The effect of ether on the kidney, or of the other anesthetics commonly used in this country, depends less upon their direct toxic action than upon the changes brought about in the blood pressure. In order to understand how variations in blood pressure may affect the kidney, we must consider the nature of renal activity. The secretion of urine is the result of two processes. It begins with the filtration through the glomerulus of all the constituents of the blood plasma, except some protein molecules of high molecular weight. As the filtrate so formed

passes through the renal tubules, certain substances, such as sugar, are reabsorbed; other substances, such as the salts of ammonia, are excreted by the cells of the tubules. Water is reabsorbed; it has been estimated that of the 120 cc. of water filtered through the glomeruli per minute, only 0.5 cc. finally escapes in the urine.

The glomerular filtration depends upon the pressure within the arterioles that form the glomerulus. When the systemic blood pressure falls to around 75 millimeters of mercury, urine formation is arrested (H. Smith, page 30). It is easy to understand how important it is, from the standpoint of preservation of the renal function, to keep the blood pressure well above the point at which filtration through the glomeruli no longer takes place. The maintenance of an adequate blood pressure is of course only in part dependent upon the anesthesia. Other factors, such as the organic condition of the circulatory system, the length of operation, the degree of shock, and the position of the patient, are important. It is the duty of the anesthetist to keep close watch on the blood pressure, and to notify the surgeon if it shows a tendency to drop. In such cases, or in the event that the operation is likely to be prolonged or especially productive of shock, the intravenous administration of fluids should be started before the fall in blood pressure has become pronounced. The use of drugs aimed to sustain the blood pressure, such as caffeine, adrenalin and ephedrin, seems to me to be unwise; as a general rule their effect is but temporary. The use of intravenous fluids and especially of blood transfusions is much to be preferred.

The cessation of urine formation for a period of several hours is undesirable but does not cause retention in the blood of waste products in sufficient quantity to threaten the safety of the patient. If postoperative excretion is stimulated by intravenous fluids, the kidneys, if normal, quickly make up for their temporary idleness. If the kidneys are infected, the temporary cessation of activity permits the accumulation of the products of infection—pus and toxic material—thereby making it more difficult for them to resume the necessary activity. One might compare the kidneys, in such a situation, to the motor of a very old automobile. While the car is running easily on a smooth road, all is well, but let it encounter a steep hill and the engine will knock, skip, back-fire and perhaps quit altogether.

These factors which we have discussed are even more important when the patient is in the old age group. In this type of patient, the reasons for maintaining the blood pressure are even more potent than in younger individuals. Beecher states that when the blood pressure in these individuals falls, cerebral thrombi may begin to develop and may cause the death of the patient within the next three or four days. In elderly patients, furthermore, we are dealing with an organism whose renal function is likely to be less able to withstand sudden changes in blood pressure because the walls of the glomerular arterioles may already be damaged by arteriosclerosis. The vascular system, owing to arteriosclerotic changes, is less elastic; if these changes involve the coronary arteries, the supply of blood to the heart muscle is more easily interfered with. As a result of this, cardiac failure is more of a threat.

It has long been my belief that carrying old people through operations successfully depends upon a maintenance of their metabolic equilibrium.

In other words, the operation should make the briefest possible break in their normal routine of life. Severe preoperative purging, preoperative dehydration, preoperative medication which slows down their metabolism, are all bad. Old people will not stand a period of reduced bodily activity; we learned this when we tried to do prostatectomies under scopolamin anesthesia. Some of the patients never regained consciousness after operation. For the same reason, I fear to use avertin in this class of patient.

The ideal situation, I believe, is to have the patient in fair possession of his faculties when he takes the anesthetic, and to have him regain consciousness within half an hour after the termination of the operation. I do not mean to imply that I favor no preoperative medication; a gentle lulling of apprehension by means of three grains of sodium amytal, plus one sixth grain of morphia one half hour before operation, or the use of two doses of an eighth grain of morphia, given one and a half hours and one half hour before operation, is not too much.

During the administration of an anesthetic by inhalation, the depth of anesthesia must necessarily be left to the anesthetist. There will be fewer dirty looks cast by the surgeon in the direction of the head of the table if the patient is kept at a steady level of deep anesthesia, but anesthesia given in this way is not the best anesthesia. The anesthetist should lighten the anesthesia whenever possible; in order to do this successfully, he must know which portions of the operation are likely to excite undesired reflexes and which portions require less depth of anesthesia. In kidney operations, for example, the stimulation of the diaphragm produced when the upper pole of the kidney is being freed may cause a vomiting reflex. During the freeing of the kidney, therefore, the patient must be more deeply anesthetized. That part of the operation during which the wound is being sutured calls for a lighter anesthesia. The actual enucleation of the prostate (if any surgeon is so benighted as to perform this allegedly outmoded operation) requires complete relaxation of the patient's abdominal muscles; the anesthesia must be deepened during this part of the operation. An experienced anesthetist is aware of the varying requirements as to depth of anesthesia and will govern himself accordingly.

The use of evipal or some similar intravenous anesthetic has a distinct value in urology. In cystoscopies that are likely to be unusually painful this method of anesthesia is excellent. The bladder may be examined and the ureters catheterized; the cystoscope can be removed, leaving the catheters in place. The absence of postanesthetic nausea makes pyelograms possible, although the possible lack of cooperation on the patient's part, insofar as he is unable to hold his breath, is an undesirable factor. Many patients regain consciousness sufficiently to do as they are requested. If the catheterization of the ureters is likely to be difficult, as it is in many tuberculous bladders, spinal anesthesia is preferable to evipal.

The value of spinal anesthesia in urology is given very different ratings by urologists. Some employ it in almost all their operations, even those on the kidney; others use it but rarely. My own position in this matter calls for a brief historical memoir. In 1911 when the urological service was formed at the Massachusetts General Hospital and placed under the leadership of Dr. Hugh Cabot, spinal anesthesia was being given by Dr. Freeman Allen, who was one of the first men in Boston to specialize in anesthesia. The results were encouraging enough to

cause Dr. Allen to persist in advocating this method of anesthesia, and during the following decade he gave many spinal anesthesias. Dr. Arthur Chute used spinal anesthesia habitually in the second stage of his suprapubic prostatectomies; the first stage was done under local novocain infiltration.

The chief objection to spinal anesthesia as it was then given was the tremendous fall in blood pressure which often followed the injection. A rapid drop of the systolic pressure to 60 millimeters of mercury was not unusual; the patient exhibited all the signs of shock except as regards the pulse rate, which often became slower than normal. At times the patient would become unconscious. I can remember a few instances in which respiration ceased temporarily, requiring artificial respiration.

The reason for the fall in blood pressure was not definitely understood. With the purpose of trying to solve this problem, Dr. William T. Porter, Professor of Comparative Physiology at the Harvard Medical School, and I studied the effect of spinal anesthesia on the blood pressure of cats. Some seventy-five experiments were made. Most of the cats were anesthetized with curare, artificial respiration provided through a tracheotomy tube, and the arterial blood pressure depicted on a smoked drum by means of a cannula in the carotid. The dura covering the spinal cord was then exposed by a lumbar or lower thoracic laminectomy and different amounts of tropacocaine or novocaine in various dilutions were injected. The extent of anesthesia was determined by electrical stimulation of the dorsal columns of the cord and of the sciatic nerve. As a result of our experiments we came to the following conclusions:

1. In our experiments with spinal anesthesia, there was in twenty animals but one case in which a moderate but adequate injection in the lumbar region caused a fall in blood pressure that might have been serious (to 55 millimeters); and in the eight cases in which no curare was used there was no paralysis of respiration after lumbar injection.

2. Even after marked falls in blood pressure partial but sufficient recovery took place in from thirty to ninety minutes. The duration of low blood pressure appeared to depend more upon the amount of drug injected than upon the site of the injection.

3. The fall in blood pressure seen after lumbar and dorsal injection is due to paralysis in the splanchnic region. In our numerous observations, it was not due to paralysis of the bulbar vasomotor center.

4. A strength of the drug sufficient to paralyze the afferent sensory paths in the cord (so that stimulation of the central end of the sciatic nerve produces no reflex) will also paralyze the efferent vasomotor fibers.

5. The nerve roots may in some cases be paralyzed without disturbing the conductivity of the vasomotor paths in the substance of the cord.

6. There is some evidence that different functions may be affected differently; thus in three experiments the motor paths were paralyzed more easily than the sensory paths.

7. Regarding the diffusion of the drug in the spinal canal, the volume seemed on the whole a factor of greater importance than the strength of the solution. Dilute solutions usually but not always spread further than concentrated solutions.

8. Gravity is a factor of some importance; tilting the animal at an angle of 40°, head downward, increased the diffusion of the drug.

9. Fixation of the drug is only partial. In three experiments, after twenty-five, sixteen, and eighteen minutes respectively, enough remained free to paralyze other nerve fibers.

10. In seven experiments, as the effect of the drug began to wear off, the stimulation of the sciatic nerve caused a fall of blood pressure instead of the usual rise. In these cases, the normal reflex rise returned before the blood pressure attained its original level.

11. A greater fall of blood pressure occurred in the cases in which adrenalin was used in connection with tropacocaine or novocaine.

12. Measures taken to raise the fallen blood pressure were of little value. It was easy to restore the blood pressure to normal but the normal level could be maintained but a few minutes.

In the twenty-five years that have elapsed since that time, I have had no reason to believe that these conclusions were not substantially correct. More recent investigations show that vasomotor paralysis of the lower extremities is also a factor. Tendency of the blood pressure to fall still remains the outstanding disadvantage in spinal anesthesia. Many measures have been tried with the hope of preventing this vasodepression. One of the earliest was the use of rebreathing; the increase in carbon dioxide caused deeper respirations, and these in turn pumped the blood out of the splanchnic vessels, where it accumulates in shock and in vasomotor collapse due to spinal anesthesia, and returned it to the general circulation. Adrenalin was used, but failed because of the temporary nature of its effect. Ephedrin, introduced by Chen in 1925, has met the situation in a fairly satisfactory manner. Chen used this drug to offset the effects of experimental shock; Ockerblad and Dillon in April 1927 advocated its use as protection against the fall of the blood pressure in spinal anesthesia.

It has appeared to me, perhaps wrongly, that patients whose blood pressure has been sustained by ephedrin show a greater tendency to a secondary fall occurring four or six hours after operation. Figures to prove this are lacking; but I have a strong impression that this is so.

For these reasons, the urological service at the Massachusetts General Hospital has used spinal anesthesia relatively little in the past three years. The excellent results which followed the use of gas-oxygen-ether, given by anesthetist nurses under the supervision of Dr. Beecher, have caused us to prefer this method in the majority of cases.

Within the past year we have reverted to the use of spinal anesthesia in transurethral resection. In these cases, anesthesia need involve only the "saddle" area—the bladder neck, the perineum and the urethra. This distribution of anesthesia can be obtained by injecting one hundred milligrams of novocaine dissolved in two cubic contimeters of spinal fluid through the space between the fourth and fifth lumbar vertebrae; the patient should be kept in a sitting position for five minutes. The anesthesia thus obtained is often so sharply limited that the sensory nerves of the bladder wall are not paralyzed; the patient may experience discomfort if the bladder is unduly distended. Often, also, the motor nerves of the legs and feet are not entirely paralyzed; in patients who are poor risks, it is better that they should not be. If vasectomy is done, spinal anesthesia of this type will not affect the sensory nerves of the spermatic cords, hence local anesthesia will have to be used for this part of the operation. Such an anesthesia should last for a period of one to one and a half hours.

One might think that spinal anesthesia would be ideal for perineal prostatectomy. Frequently it is, but in a number of patients anesthetized by this method, the drug extends too far up the cord and causes a fall in blood pressure, or does not extend quite far enough. In the latter event, the perineum will be anesthetized, but the patient will have sensation in his thighs and hips and the exaggerated lithotomy position which this operation demands will become acutely painful.

Spinal anesthesia is ideal for perineal urethrotomy and difficult cystoscopy. For painful manipulations within the bladder, such as the electrocoagulation of tumors or the extraction of ureteral stones, spinal anesthesia is our choice. If the sensory nerves from the bladder wall are anesthetized, the bladder loses its tendency to contract when stimulated and its capacity is temporarily increased. These factors are of the greatest aid in intravesical manipulation. Sacral anesthesia, with or without parasacral block, has never been extensively used on our service. A low spinal, which is easier and quicker to carry out, has seemed preferable.

The surgeon of today is fortunate in having this wide choice of methods of anesthesia. Frequently his selection of one method as against another depends upon the experience and ability of his anesthetist. One would prefer a well-given ether to a poorly given spinal, or a well-given spinal to a poorly given ether. In many cases the preference of the patient may be properly considered; some patients fear the loss of consciousness, whereas others welcome it.

No matter what anesthetic is employed, the personality of the anesthetist is a factor of importance. A few reassuring words to the patient before induction, or an attentive, sympathetic attitude through the duration of a spinal anesthesia, are favors that the patient never forgets.

ANESTHESIA FROM THE VIEWPOINT OF A GENERAL SURGEON

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As a medical student I seldom saw anesthetic agents used other than ether. In fact, at that time one of the professors of surgery, whom I admired particularly, refused to use any anesthetic except drop ether and that had to be given by his own anesthetist. So proficient was she in the administration of drop ether and so willing was she to teach medical students how to administer it, that we seized every opportunity to assist in its administration.

Read before the meeting of the Mid-South Post Graduate Nurse Anesthetists' Assembly, Memphis, Tennessee, February 14-15, 1940.

Little, if any, preliminary medication was given and we were cautioned particularly in regard to the disadvantages of preoperative doses of atropine because this drug masked the pupillary reflex and hence did not allow determination of the margin of safety in the administration of ether. Although the patients went to sleep rather slowly

because of the prolonged period of induction, perfect relaxation was obtained almost always and the patient's postoperative course seldom appeared affected as the result of the anesthetic unless the operation was unduly long or the depth of the anesthesia greater than was necessary. Even under these circumstances few, if any, deleterious effects were noted, provided the patient's general condition had been reasonably satisfactory at the time of the operation.

As a surgical assistant, my respect increased for ether as a general anesthetic and as a supplementary agent to local and regional anesthesia administered by one of the few experts of that day, Labat, and ether has continued to merit the respect of the general surgeon. I cannot remember ever having seen a patient die from an ether anesthetic.

With the development of regional and nerve block anesthesia, supplementary general anesthetic agents such as nitrous oxide and oxygen began to be used more frequently. Then Luckhardt and Carter introduced ethylene, which began to replace nitrous oxide and oxygen because of its ability to produce anesthesia quickly even when the concentration contained larger quantities of oxygen than could be used with nitrous oxide. With its more or less general adoption the possibilities of explosion from static sparks led to its being discarded by many, while others placed elaborate apparatus in the operating rooms to serve as ground conduction of static electricity which might occur in the vicinity of the patient or the anesthetist.

Although spinal anesthesia had been used in a large series of cases, such as those of Babcock,[2,3] prior to the introduction of ephedrine, the use of this substance to maintain reasonably normal blood pressure compensated for the troublesome drop in blood pressure which frequently accompanied the administration of a spinal anesthetic. As a result more and more outstanding surgeons have advocated the use of spinal anesthesia in almost a routine fashion. Personally I prefer to use spinal anesthesia whenever it seems to be the preferable procedure and the risk of its administration over that of a general anesthetic seems justified. Among the cases for which I would choose spinal anesthesia are those in which a general anesthetic is contraindicated, such as in bronchiectasis, active pulmonary tuberculosis and marked obesity. Under these circumstances I have not hesitated to use it when necessary for operations on the lower part of the abdomen but never in doses exceeding 150 milligrams. For lesions of the upper part of the abdomen or of the kidney I feel that it should be used only in selected cases when the risk of a general anesthetic and the difficulty of the operation warrant. I have never felt justified in using it in the presence of severe anemia.

Cyclopropane gave promise of being an ideal gas for anesthetic purposes, since it combined a high concentration of oxygen with better than average relaxation of the abdominal muscles. Its explosive nature and its toxicity, however, have abruptly decreased the enthusiasm for its use.

More recently intravenous anesthesia, induced by such agents as sodium amytal, pentothal and pentobarbital sodium, has been employed in a sufficient number of cases to indicate that for short operations and with careful administration it is a satisfactory method, producing rapid and pleasant narcosis without much relaxation, unless supplemented by some other type of anesthesia such as regional or infiltration.

With this comment on these various anesthetic agents, I have reviewed briefly the development of anesthesia during the past twenty years. During this time I have been particularly fortunate in being associated with a large number of nurse anesthetists, and some of them have had experience in the administration of drop ether alone exceeding the number of years in which I have done surgery. During the past sixteen years their work has been done under the supervision of Dr. Lundy and other members of his section, Drs. Tuohy, Adams and Mousel.

Since I have seen what the experienced nurse anesthetist can accomplish with open drop ether and since I remember the safety of its administration, the relaxation obtained and the ability to maintain the patient at a depth of anesthesia at which he is able to mumble his name on reaching his room after the operation, it is quite natural that I should have a high regard for this method. On innumerable occasions when various anesthetic mixtures were being administered by machine, and the anesthetist was struggling to improve the patient's breathing and to obtain a depth of anesthesia with sufficient relaxation so that the surgical procedure could be carried out with reasonable accuracy, I have asked the anesthetist to change the method of administering the anesthetic from the machine to drop ether. In most instances the patient who had been a troublesome problem began to breathe deeply and regularly. After a few minutes of delay to allow sufficient ether to be given, the breathing became regular, its depth increased and relaxation occurred. I believe that such struggling against the pressure of the gas in the machine and in the rebreathing bag of the machine may account, in large part, for the increasing frequency with which pulmonary atelectasis following operation has been noted in recent years. Further evidence of the pressure with which such gas may be forced into the lungs is the frequency with which gas also is forced into the stomach, ballooning it up to an almost unbelievable extent. Dr. Lundy has shown that when this occurs, that if the anesthetist will remove the mask and pull up the patient's tongue and the surgeon will squeeze the stomach, the gas in it can be expelled readily in most cases. If this result is not obtained, it is our custom to pass a stiff stomach tube into the stomach, which immediately evacuates the gas, and the tube is allowed to remain there as long as necessary to accomplish its purpose during the administration of the anesthetic.

Personally I like a light anesthesia and have gone back to the ethylene, oxygen and ether mixture administered by means of a gas machine. This enables more rapid induction, and ethylene and oxygen are more pleasing to take than ether alone. If, for any reason, either because the patient is not taking the anesthetic well or if there is not sufficient relaxation, I ask that a change be made to the administration of ether by the open drop method.

Before spinal anesthesia attained the prominence which it now occupies, more attention was given to the performance of surgical procedures using local anesthesia produced by infiltration of lines of incision, by blocking of the field and by nerve block. That the toxicity and the availability of the drugs used for spinal anesthesia might influence the surgeon in his decision as to whether to employ spinal or nerve block is evidenced by the fact that in one of the countries of Central Europe which I visited in 1932 to study the problem of partial gastrectomy for peptic ulcer, spinal anesthesia was sel-

dom used while abdominal wall block and splanchnic anesthesia were developed so highly that practically all gastric operations in the outstanding clinics were done under this type of anesthesia. Interestingly enough, the toxicity of the solutions used for such injections prevented their use as intraspinal anesthetics. The same enthusiasm for splanchnic anesthesia continues not only in that country but in other European countries. Recently Adám of Budapest stated that he performs practically all of his operations under some type of local, regional or nerve block anesthesia, and Ogilvie of London strongly recommended splanchnic nerve block for operations on the stomach. We have been able to obtain practically the same results by various field blocks, particularly of the abdominal wall, supplementing them with light gas anesthesia. In most of the operations on the stomach and duodenum the anastomosis itself can be done with a minimal depth of anesthesia; in fact, it is seldom necessary for any anesthetic to be given because the patient has little pain during the anastomosis unless traction is placed on the mesentery.

In the performance of operations on the kidney, although some of my colleagues have increased the use of spinal anesthesia, I have found that infiltration with procaine hydrochloride in the line of incision, with nerve block of the eleventh and twelfth nerves, relaxes the lumbar muscles to the extent that the kidney can usually be exposed without pain or discomfort to the patient. When traction is placed on the renal pedicle, however, it is usually necessary to give some supplementary general anesthetic such as the ethylene-oxygen mixture. This type of anesthesia was used routinely by von Lichtenberg at St. Hedwig's Hospital, Berlin, for operations on the kidney, but Marion of Paris preferred spinal anesthesia.

With the types of anesthesia which I have mentioned, preliminary medication can be used to great advantage. At the Mayo Clinic the patients are routinely sent into the hospital the afternoon preceding the day on which the operation is scheduled. A light supper is given and one of the barbiturates is administered that evening. We have found pentothal sodium [sodium ethyl (1-methylbutyl) thiobarbiturate] to be a very satisfactory agent. A dose of 1½ grain (0.1 gram) is given about an hour before the operation is scheduled. When a patient is called to the operating room, a small dose of morphine, usually not more than 1/6 grain (0.01 gram) is given.

In the Calhoun Lecture delivered by Dr. Lundy last year, in commenting on the use of anesthetics and analgesics in general medical practice, he expressed himself as follows:

"It is desirable to have a medical anesthetist in each hospital and medical school.... Perhaps the best we can expect is that a reasonably competent physician anesthetist will be in charge or will supervise the work in as many hospitals and medical schools as can be supplied from time to time." Such a consultant anesthetist can be of the greatest value to the surgeon as well as to the nurse anesthetist. To the surgeon he can suggest various types of anesthetic agents to be used in complicated cases and, when spinal anesthesia or nerve block injections are to be given, he can carry out this procedure himself or assist in teaching the surgeon to do so. His advice can be sought by surgeon or nurse anesthetist whenever it is necessary to support the patient during the period of anesthesia, or when traumatic shock is present. In this connection Dr. Lundy mentioned the following measures:

"(1) artificial respiration and resuscitation, which frequently are necessary in obstetric practice, (2) supportive treatment and the treatment of shock, which include transfusion of blood and the intravenous administration of stimulants, (3) assistance in certain diagnostic and prognostic procedures, (4) the administration of oxygen and certain other gases, and (5) the postanesthetic aspiration of material from the bronchi and respiratory passages, which makes it necessary for the anesthetist to be more or less familiar with the use of the laryngoscope and bronchoscope.

"Consultants may find that the anesthetist is able to give them valuable assistance in the care of patients who require unusually large doses of sedative drugs or who must be supported because of an overdose of a drug."

The most favored of the recently developed anesthetics have been those administered intravenously. The method is theoretically more simple than the use of gas by inhalation. Although at first used for minor operations of short duration, there has been a great tendency to extend its field to include almost any type of operation, the performance of which is not to be of too long duration. Lundy stated that it should be used only for adults who are in good condition. His method consists of injecting slowly "a 2.5 per cent solution of pentothal sodium (sodium ethyl 1-methyl butyl thiobarbituric acid) or evipal (sodium n-methyl cyclohexenyl methyl malonyl urea). The effect on the patient's respiration must be kept under observation, that is, breathing should be satisfactory and should not stop. For this purpose, wherever possible, a bit of paper or cotton should be suspended before the nostrils or mouth in order that the inhalation or expiration of air may be observed. In institutional practice, oxygen is often administered simultaneously to advantage." Lundy expressed the belief that it is desirable that administration of all intravenous anesthetic agents should be carried out by a physician or at any rate under his direct supervision.

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INTRATRACHEAL INHALATION ANESTHESIA

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Presented at the sixth annual meeting of the Mid-South Post Graduate Nurse Anesthetists' Assembly held in Memphis, Tennessee, February 14-15, 1940.

Historically, laryngeal intubation is older than general anesthesia itself. Waters has shown in his excellent review of the history of intratracheal anesthesia that many devices and points of technique described as new in recent years have already been mentioned by former observers.

The maintenance of a free airway has long been recognized as a first principle in general anesthesia, and the danger of complete laryngeal obstruction needs no mention. Partial respiratory obstruction, however, has serious cumulative effects which have been frequently overlooked, and it is entirely possible that many surgical complications blamed upon the anesthetic have actually been due to an imperfect airway. The presence of an intubation tube in intratracheal anesthesia creates a thoroughly patent airway under the anesthetist's control at all times. There is no glottic spasm to interfere with the respirations as the patient is unable to close the glottis and thereby exert pressure on the diaphragm by the air held in the lungs.

Elsberg popularized intratracheal anesthesia in 1910. At that time the method was described as an ideal one and accepted widely. Later it fell into disfavor but is in recent years again being used by many familiar with its advantages. Intratracheal anesthesia was originally performed by means of insufflation, which meant the introduction of vapors under measured pressure. This entailed the necessity of a motor driven apparatus with pressure manometers. It was necessary to employ a small catheter for the escape of the outgoing vapors. As a result the operator was continually annoyed by the escaping vapor and anesthetic odors. Motor driven pressure blowers occasionally failed, producing dangerous interruptions in the insufflation of anesthetic vapor. The introduction of the single large tube with a maximum lumen has changed the procedure from insufflation to inhalation, so that today it is unnecessary to use a motor-driven apparatus, and as no vapor is blown into the lungs, it is no longer necessary to provide means for its escape.

DETAILS OF THE PROCEDURE

Many techniques have been devised for laryngoscopy and intubation with general anesthesia. As in all other procedures the best technique is that which the anesthetist finds most suitable in her hands. We resort entirely to oral intubation by direct vision and find it satisfactory for all cases.

Preoperative sedation, as in other forms of anesthesia, seems to facilitate the induction of anesthesia, and we make it a practice to give morphine in combination with scopolamine forty-five minutes to one hour before the operation. Careful inspection of the teeth is performed

to determine the presence of loose teeth, bridges or inlays. Induction is carried out with a gas-oxygen mixture until a point is reached when the pharyngeal reflexes are abolished and the teeth may be separated without difficulty. At this time the pharynx and hypopharynx must be completely evacuated of all saliva and mucus by means of suction.

With the patient lying flat on the table the head is slightly extended and the laryngoscope, which is held in the left hand, is passed over the dorsum of the tongue, while at the same time pressure is made on the patient's forehead, further extending the head. The epiglottis may then be seen just beyond the end of the laryngoscope. By inserting the instrument a short distance farther the epiglottis can be caught and lifted upward with the tip of the laryngoscope. The teeth will not be damaged at this stage if the lifting motion extends over the entire blade of the laryngoscope at once rather than utilizing the upper teeth as a fulcrum. As the epiglottis is lifted upward the glottis is brought into view and the vocal cords are readily seen. The vocal cords separate on inspiration and come together on expiration, therefore, an inspiratory phase should be awaited before the intratracheal tube is inserted into the glottis. The tube, which has been previously lubricated with mineral oil, is passed well down into the trachea, and the attached cuff containing the balloon is inflated lightly with air from a syringe to prevent leakage of air or fluid about the tube. The connection is then established and the intratracheal anesthetic begun.

DISCUSSION OF PROCEDURE

Nasal intubation is unquestionably advantageous in operative work about the mouth and throat; in operations on other parts of the body, however, it would possess no especial attributes. A tube passing through the nasopharynx is grossly contaminated with secretions and to permit such contamination to be carried into the trachea invites infection in the respiratory tract. The intratracheal tubes and apparatus should always be sterilized, and if care is taken in inserting the tube through the slot in the laryngoscope it need contact no structures which might serve to produce an infection.

The direct vision laryngoscope, in general use, has batteries in the handle and its simplicity of construction lends itself well to those inexpert in laryngoscopy. Either the Magill curved tube or the semi-rigid rubber silkwoven catheter may be used in the average case. The Magill tube is curved, primarily, for passage through the nasopharynx; however, it may be used as well for oral intubation. The rubber silkwoven catheter, being semi-rigid and straight, is somewhat more suitable for oral use. We have found no necessity for resorting to the metal tube introduced by Flagg. The catheter should always be lubricated before passage, as a lubricated tube is less likely to injure the vocal cords.

Forcible intubation when the vocal cords are closed might result in damage to those structures. The cords will separate widely on inspiration and intubation may be easily performed at that time. If the vocal cords fail to separate when the laryngoscope is in place it is a simple matter to introduce a small quantity of carbon dioxide through the laryngoscope with the result that the cords will abduct widely. Complete abduction of the cords can be assured by a proper excess of carbon

dioxide in the anesthetic atmosphere just previous to exposure.

No unusual apparatus is necessary to supply the anesthetic vapors. For gas-oxygen mixtures a small rebreathing bag is employed in order to avoid positive pressure. Prolonged positive pressure causes ischemia of the bronchial mucosa. When ether vapor is given, a single tube with an outlet valve may be used.

A suction apparatus should be continuously available from the beginning of the anesthesia. The pharynx should be aspirated before intubation, and following intubation a small catheter may be used to remove any secretions which have formed in the bronchial tree. There is no excuse for permitting secretions to collect in the air passages as they can be removed readily by suction through the intubation tube.

INDICATIONS FOR INTRATRACHEAL INHALATION ANESTHESIA

Operations about the head and neck

Anesthesia in oral surgery is frequently a trying problem. Continuous venous oozing and the presence of small particles of foreign matter render anesthesia hazardous. Pharyngeal insufflation by nasal catheter is usually employed for this type of work and the surgeon is annoyed with anesthetic vapors throughout the procedure. Intratracheal anesthesia removes the anesthetic from the field of operation and permits the oral surgeon to manipulate the soft parts without any interference with respirations. With the balloon on the tube inflated there is no fear of aspiration of blood or other foreign material into the lungs.

In operations on the brain where general anesthesia is required the intratracheal technique offers many advantages. The assembly is ideal for administering artificial respiration should it become necessary, and the patient's position on the table presents no difficulty to the anesthetist.

In removing tumors of the neck, such as large nodular goiters, occasionally tracheal collapse occurs. The presence of an intratracheal tube obviates this danger and allows for considerable manipulation of the trachea without interference to respirations. Sudden severe hemorrhage from the large vessels of the neck may be controlled by packing without fear of tracheal compression. In instances where tracheotomy is to be performed electively the procedure may be carried out leisurely and with safety when an intratracheal tube is in place.

Operations on the chest

The margin of safety in surgery of the lungs is increased with the intratracheal technique. Blood, mucus or pus which may be expressed into the bronchi through manipulation of the lungs is easily removed by suction through the intubation tube. The bronchial balloon devised by Guedel and Waters in experienced hands can serve to maintain the lung on the exposed side in a state of collapse by blocking the bronchus on that side while the uninvolved lung is used to carry the anesthesia. Collapse or expansion of the lungs can be produced at will to meet the needs of the surgeon.

Abdominal Operations

Movements of the abdominal wall, diaphragm and viscera are almost imperceptible in the intubated patient. The surgeon operating with this form of anesthesia for the first time is apt to become alarmed at the apparent inadequateness of respirations. The relaxation is marked and closely approximates that secured

by spinal anesthesia. Intratracheal anesthesia is not necessary for the average mid- or lower abdominal procedure; in upper abdominal surgery, however, due to diminished excursions of the diaphragm, the surgeon is able to work without disturbance from motion of the liver or diaphragm. Traction upon these structures may be carried out without undue respiratory embarrassment.

Case Report

The patient was a woman aged 30, with what appeared to be a posterior, superior space subdiaphragmatic abcess on the right side. Under intratracheal inhalation anesthesia the patient was placed on her left side and an extrapleural, extraperitoneal approach carried out with removal of the twelfth rib. The diaphragm was adherent to the right dome of the liver and it became necessary to separate those structures in search of the abcess. This manipulation produced considerable trauma to the diaphragm but did not affect the patient's respirations in any way. After completely mobilizing the diaphragm the abcess was located in the dome of the liver itself. Drainage was instituted and the operation completed. The patient's immediate postoperative condition was good and she made an uneventful convalescence. Local anesthesia may be used in the average case of subdiaphragmatic abcess. In view of the relative inaccessibility of this abcess local infiltration would have been ineffectual in preventing pain. Intratracheal anesthesia proved to be an ideal anesthetic for the procedure.

In operations for intestinal obstruction intratracheal anesthesia may be of distinct benefit. The relaxation is of great importance, and occasionally manipulation of the distended intestines will result in emesis of large quantities of fluid. Such patients have been known to drown in the aspirated stomach and intestinal contents. The intratracheal technique will prevent aspiration from occurring.

CONCLUSION

Intratracheal inhalation anesthesia has, in our hands, proven to be a satisfactory procedure in selected cases. There are definite indications for its use which I have attempted to describe. In our series, which is yet small by comparison, there have been no important sequelae. There was one instance of tracheitis for a few days following removal of a large adherent goiter; however, in view of the trauma to the trachea necessitated by the operation and the realization that such operations frequently produce some tracheitis, too much blame cannot be placed upon the anesthesia.

The instrumentation necessary for intubation has probably frightened many anesthetists away from the technique. Laryngoscopy, however, in the anesthetized patient is not a difficult procedure and the technique may be learned by any willing, capable anesthetist.

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THE ORGANIZATION AND MANAGEMENT OF A GAS THERAPY DEPARTMENT

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Read at the sixth annual meeting of the Mid-South Post Graduate Nurse Anesthetists' Assembly, held in Memphis, Tenn., February 14-15, 1940.

The term "gas therapy" is used popularly to apply to those therapeutic gases which overcome anoxemia in the treatment of disease. Although there is much effort being made by the New York Society for the Prevention of Asphyxial Deaths to combine the terms "gas therapy" and "anesthesia" and use the scientific term "pneumotology,"[1] the new terminology as yet has not been universally accepted.

The purpose of a gas therapy department is to have well-trained personnel effectively administer, by the various methods, the therapeutic gases—helium, oxygen, and carbon dioxide, to relieve or prevent a vicious cycle manifested by "oxygen want."

The person who should be responsible for this form of inhalation therapy in the hospital depends upon the size of the institution and its administrative set-up. Since it is used principally for medical patients, it virtually belongs in the realm of the medical department. Comparably, there are few medical departments carrying out an elaborate research program; in such case, the gas therapy department should constitute a subdivision of medicine, and the duties are usually performed by physicians and specialized technicians.

In the small hospital or the one whose medical staff is not doing research or especially interested in this field, the supervision of this department should be the duty of the anesthetist. "Whether unconsciousness is deliberately induced by an anesthetic agent, or accidental, as in the case of carbon monoxide poisoning, submersion, asphyxia neonatorum, etc., the anatomical and physiological result, as it becomes apparent in the musculature —the reflexes, respiratory and circulatory phenomena, may for all practical purposes be regarded as identical."[2] Special instruction is necessary, in order to understand the pathological physiology of the various conditions for which these therapeutic gases are intended, as well as thorough training in their administration. The present trend in schools of anesthesia for nurse anesthetists is to incorporate this theoretical and practical instruction in their curriculum in order to qualify the nurse anesthetist for this responsibility.

A full-time nurse anesthetist in the small hospital can readily assume the duties of both positions. The manner in which the gas therapy department is organized and managed depends on the amount of time that can be devoted to that department, and it should be under the direction of a staff physician

in medicine; whereas, the Anesthesia Department is usually the responsibility of a surgeon, if a medical anesthetist is not the Director of Anesthesia. In the event that time does not permit the nurse anesthetist to give all the treatments, she should organize the department, select and teach the prospective technicians or nurses why, and by what methods the gases are given, and supervise the activities of the department. Recommendations for the purchase of equipment should likewise be made by her.

In some hospitals where the demand for this treatment is on a small scale, it may be advisable to have oxygen, helium-oxygen, and carbon doxide-oxygen equipment dispensed from the central service supply room. With this type of set-up the nurse anesthetist would perform the duties as outlined, but the nurses or internes would administer the oxygen.

Where the oxygen demand is heavy, it is better to have a special place assigned for storage of the gases and equipment. The department should be staffed to give an uninterrupted twenty-four hour service. Men are preferred for this duty because of the necessity for transporting heavy cylinders and cumbersome equipment. It would be ideal to employ male nurses for this position, but if the hospital budget will not permit, intelligent men can be instructed in the reason for and thoroughly trained in the methods of administering oxygen. It would be their duty to give all oxygen treatments by the various methods as ordered by the doctor.

In my opinion, the carbon dioxide-oxygen and helium-oxygen treatments should be administered by the anesthetist. It may be necessary, however, during the night to have someone relieve the anesthetist who is on twenty-four hour operating room call. In such instances nurses assigned that duty should be carefully selected. They should receive well integrated, supervised clinical experience and intensive instruction in the characteristics of gases, in the methods of obtaining and recognizing the physiological effects desired, and in the prevention of those which are undesired.

In the New Orleans Charity Hospital, which is a thirty-four hundred bed institution, the department of gas therapy is a separate functioning department. The paths of authority are: the Director of Medicine, the Chief Gas Therapist, who is the Educational Director of the School of Anesthesia for nurse anesthetists, the anesthesia staff, and four male technicians.

All helium-oxygen and carbon dioxide-oxygen are administered by the nurse anesthetists. The staff and student anesthetists work eight hour duty. Each week student anesthetists on duty from 7:00 a.m. to 3:00 p.m. and 3:00 p.m. to 11:00 p.m. are assigned to gas therapy. The staff anesthetist on duty from 11:00 p.m. to 7:00 a.m. gives the treatments during the night.

Resuscitation in the delivery room is done by the resident physician, the internes, and the anesthetists. Each month the internes assigned to accident and ambulance service receive instruction from the chief gas therapist in the operation of the respirator and the resuscitators. A resuscitator is kept on each of the three ambulances. When resuscitation is needed on the ward, the gas therapy technician delivers the apparatus from the accident room. Either a doctor or an anesthetist operates the machine.

The doctor's orders for oxygen therapy are carried out by the technicians. To select men for this type of work requires that definite standards regarding the individual's qualifications be specified and insisted upon. This is

best accomplished by means of job analysis.

A workable job analysis is outlined for the position of technician which incorporates the following information:

1. Name of the position.
2. Qualifications — both physical and mental.
3. Paths of authority.
4. Working hours.
5. Salary.
6. Vacation.
7. Sick leave.
8. Uniforms.
9. Equipment used.
10. Duties.

The prospective technician should have a high school education and be not younger than twenty-five years of age, or older than forty. The technician is given the Otis Self-Administering Test of Mental Ability for High School and College Students, and an average intelligence quotient is required.

Theoretical instruction of one hour each week is given to the technicians. They have the privilege of using the nurse anesthetists', the nurses', and the medical school libraries. The assignments are studied before coming to class, so that the hour may be devoted to lecture and discussion. The material is as follows:

1. The physiology of circulation and respiration.
2. Simple chemistry and physical characteristics of oxygen, carbon dioxide, and helium.
3. The pharmacological effects these gases have upon the respiratory, circulatory, and nervous systems.
4. The etiology, pathology (if any), symptoms and treatment in the various cardiac diseases, pneumonia, submersion, carbon monoxide poisoning, asphyxia of the new born, electric shock, thyrotoxicosis, headache following a ventriculography or encephalography, migraine, tuberculosis, laryngeal spasm, pulmonary edema, and asthma.
5. How the physician estimates the amount of flow the particular patient may need.
6. Types of gas therapy equipment on the market, how each operates, and the advantages of one type over another.

While these men are taught how the therapeutic gases are given and they observe the anesthetists giving them, they are not permitted to administer anything but oxygen. They are responsible for starting and discontinuing all oxygen therapy, as ordered by the physician and notified by the head nurse. The equipment is transported to the ward on a rubber-tired truck, and the oxygen tank, covered by a muslin slip, is strapped to the bed. If nasal oxygen is ordered, the technician starts the oxygen flow, lubricates, measures, and inserts the specially designed nasal catheters into the nose, using Dr. Water's technique. The approximate depth to which the catheter is inserted is estimated by measuring the distance on the catheter between the external nares and lobe of the ear. When the correct position has been found, the catheter is fastened firmly to the bridge of the nose and forehead with adhesive.

It is essential that the oxygen is flowing through the catheter before it is introduced. This will obviate the possibility of a sudden blast of water or oxygen into the oropharynx, the misplacement of a catheter, or of an obstruction in the catheter by unnoticed foreign material.

"With the catheter in the oropharynx, just distal to the swallowing reflex, and with the flow at four liters per minute, the actual alveolar con-

centrations are from 29.1 to 43.6 per cent, and with the flow of six liters per minute, the alveolar samples will range from 50.6 to 59.1 per cent oxygen."[3] The flow of oxygen is started at four liters and increased according to the patient's metabolic need. This is judged by observing the minimum oxygen rate of flow that will give the maximum reduction in pulse rate. During the treatment, a clean, perforated nasal catheter, lubricated with vaseline, is inserted in the opposite nostril every twelve hours. When there is a great deal of irritation of the nostril or the patient has a sinus involvement, the Bullowa tube or the Lombard inhaler is used. These methods require a higher oxygen flow to maintain an alveolar oxygen concentration comparable to that obtained by the nasal catheter. With the Bullowa tube a six liter flow will give between 39 to 40 per cent, and an approximate concentration of 34 to 44 per cent can be obtained with a flow of from five to seven liters of oxygen by the latter method.

Heavy canvas oxygen tents are used in the nurseries and the children's wards. The technicians wear gowns, caps, and masks when setting up the tent. At the beginning of the treatment the oxygen is allowed to flow at a high rate until the tent concentration is 40 per cent, at which time the flow is reduced to five or six liters per minute to maintain a 40 per cent concentration. A greater flow than six liters will be necessary if the 40 per cent concentration does not decrease the pulse or respiratory rate. The absence of cyanosis is certainly not indicative that the patient does not need a higher concentration, and therefore should not be used to indicate the amount of oxygen required. When the maintenance concentration has been determined, an analysis of the oxygen in the tent is made every three hours. Nurses are instructed how to give nursing care to a patient in the tent so that there will be only a small loss of oxygen. If the nursing procedure results in a marked loss of oxygen, nurses are shown how to increase the flow for a few minutes and then reduce it to the original rate of flow.

To obtain a higher oxygen concentration than 60 per cent, double nasal catheters are occasionally ordered, but more frequently, the Boothby-Lovelace-Bulbulian mask is applied. For the mouth breather or the unconscious patient with a relaxed jaw, the oronasal B-L-B mask is used; whereas, the nasal B-L-B mask is used for nasal breathers and those requiring a great deal of medication or fluids, or for patients who cough and expectorate. The concentration desired is determined by the rate of oxygen flow and the number of port holes open, as outlined by Dr. Boothby.[4]

The new Puritan mask and bag will likewise allow for a higher alveolar concentration. To secure these percentages by this method, it is essential that there be good application of the mask to the face, thus preventing the escape of gas. These mask and bag outfits may be used for continuous administration of helium-oxygen mixtures.

The most ideal way of administering oxygen is to place the patient in an oxygen ward or an oxygen chamber. The disadvantage of this method is the initial cost of the equipment and the expensive operation. The minimum twenty-four hour oxygen requirement is usually four cylinders. Hospitals having this equipment engage a technician to assume the following responsibilities:

1. Keeping the temperature between 64° to 70° except during the patient's bath, when the radiator,

controlled by a thermostat, will bring the temperature up to 75° within ten to fifteen minutes;

2. Maintaining a 50 per cent oxygen concentration;
3. Making certain that the carbon dioxide concentration is removed from the atmosphere, and when this is no longer possible the soda lime is discarded and replaced with a fresh supply;
4. Maintaining the desired relative humidity of approximately 25 per cent.

While the initial and maintenance cost of an oxygen tent is less than the oxygen room, it may yet be more expensive than the hospital's budget will permit. This is especially true in a charity institution. A tent in operation demands extra service. The tank gauges must be observed frequently to avoid the possibility of a patient being without a constant flow of oxygen. The temperature and humidity must be properly regulated. The ice chamber requires refilling, and the water container needs to be emptied several times during the day. At least every three hours the air in the tent-hood should be analyzed to determine the oxygen concentration. Similarly, in the chamber or room this oxygen concentration should not be lower than 40 or 50 per cent. If this percentage does not markedly reduce the degree of anoxemia manifested by the pulse, respiratory rate, and possibly by the patient's color, the concentration should be raised by increasing the rate of oxygen flow.

Because the literature accompanying an oxygen tent states that a flow of seven liters per minute of oxygen will give an oxygen concentration in the hood of 50 to 60 per cent is no indication that it is actually being obtained. Any defect in the rubber tubing, connections, rubber gaskets of the ice box, the material of the hood, or improper adjustment of the hood will naturally be sources of leakage with a lowering of oxygen concentration as a sequence. The trained, observant technician either makes the necessary repairs or prevents oxygen loss by adjusting the hood correctly.

In large hospitals it is especially necessary to have the gas therapy department well organized. In Charity Hospital, the hospital policy book on each ward outlines the procedures for the use of therapeutic gases. The nurse's duties regarding gas therapy treatment are to notify the anesthesia department of a new or discontinued order for helium-oxygen or carbon dioxide-oxygen inhalations, to call the gas therapy technician to deliver a resuscitator to the ward (the obstetrical department has its own resuscitators), and to notify the technician when oxygen therapy is to be started or discontinued. The technician is given the patient's name, ward, bed number, and the order as written by the physician, which states the method of administration and the rate of oxygen flow or the oxygen concentration desired. After the oxygen treatment has been started, the technician makes rounds every four hours when convenient. It is, nevertheless, the nurse's responsibility to see that the rate of flow is maintained.

The commercial oxygen cylinders contain 60,000 liters and when full are under a pressure of approximately 2,000 lbs. The nurses are instructed to notify the technician when the pressure gauge indicates 100 lbs. remaining in the cylinder. This procedure allows time to replace the almost empty tank with a full one, and eliminates the possibility of the patient being without oxygen.

The gas therapy department dispenses oxygen to the basal metabolism

rooms, the physical therapy department for artificial fever therapy, the bronchoscopic operating rooms, the operating room in the contagious building, and the treatment room in the tuberculosis building.

The anesthetic gases are stored with the therapeutic gases in the gas therapy department. A few cylinders of the various anesthetic gases are kept in the operating and delivery rooms. Each night the technician on duty from 11:00 p.m. to 7:00 a.m. replaces the empty cylinders with full ones. In no other respect are the technicians responsible for the anesthetic gases. A staff anesthetist orders the various gases, checks them in, and checks out empty cylinders. The orders for oxygen and for mixtures of helium 80 per cent —oxygen 20 per cent, and carbon dioxide 5 per cent—oxygen 95 per cent are sent to the purchasing department by the chief gas therapist. The technician checks all incoming and outgoing therapeutic gas cylinders. The gas therapy store room and office are in the basement near the freight elevator, and the gas companies deliver the cylinders directly to this room.

All therapeutic gas treatments are charted on a blue sheet especially designed for this purpose. Space is provided for the date, hour, type of therapy, method used, amount of flow, remarks, and name of operator. When any form of therapy is started, a blue treatment sheet is attached to the chart and remains permanently as part of it. The oxygen concentration and rate of flow should, likewise, be charted after each analysis. Charting is especially valuable for teaching and it makes the hospital personnel more conscious of the importance of prescribing the dosage properly—in liters for the mask or catheter method; in per cent concentrations for the oxygen tent or room method; and in minutes when helium-oxygen or carbon dioxide-oxygen inhalations are ordered.

The anesthetist's handbook indicates the name of the patient, the ward, type of therapy, and time treatments are due. There is also a book in which the technicians record the patient's condition before and after treatment and the number of tanks used.

The equipment must be kept scrupulously clean to prevent cross-infection. The catheters and masks are washed well in hot water and allowed to remain in a bichloride of mercury 1-1000 solution for a half hour. They are then rinsed well, dried, and wrapped in clean towels ready for use. The canvas tents are sent to the laundry. The metal tent frames are washed and polished.

Oxygen tents should be scrubbed with soap and water. In some hospitals this procedure is followed by the application of other disinfectants, such as phenol compounds, bichloride of mercury, or alcohol solutions. To prevent clouding, the solutions should not be used on the windows of the tent. When not in use, oxygen tents should be stored in a dry, fairly cool, and well ventilated place. The hood will last longer if hung in a normal manner and not folded during storage.

With the exception of the delivery room resuscitators, which are cleaned by the delivery room anesthetists, the gas therapy technicians are responsible for sterilizing the resuscitators and replacing empty cylinders after each use. In addition, all resuscitators are checked by the technician.

Much emphasis should be placed on operating costs of gas therapy treatment in order to make the department self-supporting. Determining the type of equipment to be purchased or the method of administration depends largely on the financial status of the patient and the hospital. If the hospi-

tal is heavily endowed or hospitalizing principally private patients, there will be little need for concern over the initial, maintenance and operating costs of equipment. As previously mentioned, the ideal method of administering oxygen is by the use of a room, chamber, or tent; but the operating expense, that is, for the oxygen and trained personnel, is rather high. The use of catheters is the most economical and yet adequate method, using the large cylinders of commercial oxygen. Less oxygen per minute is needed to obtain satisfactory alveolar concentrations; furthermore, this technique requires no extra nursing or technical supervision for administration. Some institutions effect a saving by having the oxygen piped throughout the hospital from a central depot.

The apparatus needed and the gas consumed for carbon dioxide-oxygen inhalations are relatively inexpensive. The higher prices paid for the helium-oxygen mixtures and the necessary machine make this form of therapy rather costly, but the benefits to the patient more than offset the expense. Helium-oxygen should be given by a closed system and provision made for absorption of carbon dioxide by soda lime. This reduces the amount of gas used and allows the patient the benefit of a very light inhalation gas by preventing the entrance of nitrogen; consequently, helium-oxygen by the catheter method would defeat its own purpose. The B-L-B mask requires a continuous flow of the mixture in a larger amount than is usually needed with a rebreathing closed system apparatus.

In the writer's opinion, the private ward or county-paid charity patient should be charged only for the cost of the gas actually used; whereas, the private patient's rate should include the estimated depreciation on equipment, salaries of personnel, and operating costs. It is no longer necessary to charge a patient the tremendous sum of $25.00 a day for an oxygen tent. Besides, such exorbitant rates tend to deprive the patient of necessary oxygen therapy because of the patient's inability to pay for the treatment.

Many hospitals, as yet, do not have efficient equipment or trained personnel for the administration of the therapeutic gases, consequently the anesthetist should make every effort to assist the superintendent in providing better gas therapy service by cheerfully and conscientiously accepting the responsibility of the gas therapy department. We must not fail to recognize the need for our interest and cooperation in this field.

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THE NURSE ANESTHETIST'S PART IN HOSPITAL PUBLIC RELATIONS

ALDEN B. MILLS

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Read at the annual meeting of the Southeastern Assembly of Nurse Anesthetists, held at Edgewater Park, Miss., March 28-29, 1940.

Every hospital has public relations. The public likes us or dislikes us; people have confidence in us or they distrust us; we are considered progressive and responsive to public needs or we are thougnt to be old-fashioned or arbitrary. But many hospitals have no public relations program. They leave the formation of public opinion entirely to chance, not realizing that this often has unfortunate results.

Need for Public Relations Program

Today hospitals need public relations programs more than ever. Hospital costs are advancing as the complexity and quality of hospital service go up. The public needs to understand why costs are advancing and the benefits that accrue to them from improved service. Charitable gifts can less frequently be obtained in large blocks. Hospitals must enlist a much larger group of givers, each of whom can contribute a smaller amount. Social and other legislation sometimes menaces hospitals; legislators and voters need to understand more fully the hospital position and the requirements of a service to sick patients 24 hours a day and 365 days a year.

So more and more hospitals are awakening to the need to cultivate the public more carefully. This means a public relations program, which I have defined as "a conscious, sincere, directed endeavor to create and strengthen contacts which contribute to the development of mutual understanding, good will and respect between an institution (or business) and its public."

The objective, you see, is not merely to make the other person like us better and understand our needs more clearly. We also should understand and respect his needs and manifest sincere sympathy toward his aspirations and desires.

Basis for Good Public Relations

A good public relations program must be based on good service to the public. Without such service as a background, a public relations program becomes mere ballyhoo or press agentry; it is likely to backfire and do more harm than good.

Good hospital service, of course, is not always and everywhere the same thing. There are some geographic variations in this broad country of ours, although the work of national organizations and institutes and journals and the exchange of personnel that is constantly going on have served to minimize such differences. The time factor

is more important. Twenty years ago our concept of good hospital service was far more limited than it is today. Each year finds some enrichment of our service—in x-ray, laboratory, physical therapy, social service, diet therapy, psychotherapy and many other aspects. In your own field of anesthesia the growth in the past twenty to thirty years has been astounding.

Good hospital care involves provision for all types of disease as far as possible, service to all racial, religious, economic and age groups, well-rounded care to each patient, highest attainable quality, cooperation in public health and other community service, amelioration of medical costs, good teaching service, progressive trustee leadership and competent administration.

The Anesthetist's Part

You may be wondering what all this has to do with the hospital nurse anesthetist. I have outlined the public relations problem and possibilities thus fully so that you could have a background against which to see your own opportunities and responsibilities. We speak of a hospital as though it had an identity of itself. Actually, however, a hospital has only such personality as is given it by its directors, its administrator, its department heads, its nurses, its telephone operators and business office employees, its maids and janitors and orderlies. You, not the bricks and elevators and sterilizers, are the hospital.

From what has been said about the essential basis of a sound public relations program, it is apparent that the first responsibility that you have is to provide the best possible care that you can to the patients. There is no adequate substitute. You must have, both individually and as a profession, the highest educational standards that are possible. You must be alert to changes in the fundamental scientific bases of your vocation. You must exercise the highest skill in the technics of your service. You must, of course, be keenly aware of the tremendously dangerous potentialities of anesthesia and do all in your power to see that hazards are either removed or minimized. The most dramatic of these hazards, of course, is the possibility of explosion in the operating room. But that is not by any means all. A patient is just as dead if he dies because of inattention to his pulse and respiration as he is if he dies as a result of an explosion.

The first responsibility, therefore, is to keep your standards of competence and ethics at the highest possible level. I am happy to learn that, as a profession, you seem to be keenly aware of this responsibility and are taking steps to fulfill it.

There is a second, more intimate way in which you directly affect hospital public relations. Many patients fear the anesthetic more than they do the operation itself. Some people are terrified at the thought that they will be put in a position where they can no longer control circumstances by any possible exercise of the will. In some persons this amounts almost to a phobia, in others it is just a mild uneasiness.

Everyone in the hospital should do all that he can to make such fears unnecessary and then to overcome them. If it were possible for you to see each of your patients sometime before operation, visit with them a little, tell them something of the procedures of anesthesia and the precautions taken for their safety, things would not seem so strange and terrifying. It is fortunate that preanesthetic sedation has been shown to be widely applicable and has therefore come into more general use, for it has done much to allay the

dread of operation. However, it is an adjunct to and not a substitute for the thoughtful consideration which is the patient's primary need. For example, parading the patient past a gleaming display of surgical instruments is not particularly conducive to his peace of mind; perhaps the route of travel can be changed or the surgical instrument cabinet placed in a more inconspicuous position. Certainly when the patient arrives in the operating room nothing should be said or done that will in any way frighten him.

The late William Allison White, one of our noted psychiatrists, suggested that the boundary line between consciousness and unconsciousness is not thin and sharp but broad. If that is so, it may well be that a patient who is sufficiently anesthetized for the beginning of surgery is still sufficiently receptive to impressions so that one should guard his tongue carefully even during the operation. Perhaps we shall some day have fuller information on this point. In the meantime, it would do no harm to go on the assumption that the patient can receive mental impressions even when anesthetized.

Outside Contacts of the Anesthetist

Like all other hospital employees, you represent the hospital. In your contacts with your friends, neighbors, relatives and even casual acquaintances, what you say about your working place is likely to be accepted as ipso facto true. Would it be asking too much that you inform yourself with reasonable care about the hospital? How much free work did it do last year? What advances in quality of service has it made during the past five years? What records are being made by its alumni—nurses and interns? What are some of the needs of the hospital and how can these be met?

Of course, I don't suggest that you try to supersede the administrator of the institution, but rather that you help him or her in the public relations work of the hospital.

In addition to the informal contacts you have with various persons in the community, it is often possible to expand these contacts with relatively little effort. Through membership in women's clubs (especially professional women's groups), church and neighborhood organizations and similar groups, you can help to make the hospital's influence felt. Many of these organizations are anxious to have interesting speakers for their meetings. Anesthetists can render a service by being prepared to respond to such calls. There are many subjects which you can appropriately discuss. They include such topics as "The History of Anesthesia," "The Development of Anesthesia," "Newer Knowledge of Anesthesia," "What is Involved in Preparation for an Operation," "What Does Cleanliness Mean in a Hospital?" "Nursing as a Vocation for Young Women," and "Dramatic Incidents in the History of Nursing." Or some less formal subject might be chosen, such as "Amusing Incidents in Hospital Life," or "Patients I Have Known."

Events that can make interesting stories happen in every hospital, if we are just alert enough to discover them. Recently the Sherman Hospital at Elgin, Illinois, had an article on the front page of one of the large Chicago newspapers regarding a patient who had come into the hospital for twenty-seven days and had stayed twenty-seven years. He was celebrating his eightieth birthday and the whole hospital was turning handsprings to make the occasion a happy one. A story of that kind will travel far and be repeated by many people; it will do much good for the hospital.

The Methodist Hospital in Indianapolis each year has a "whispering campaign." Every member of the hospital's personnel and its extensive auxiliary agrees to tell at least five persons some nice thing about the hospital. Why couldn't each of us take part in such a whispering campaign?

In summary, therefore, I suggest that every one of us realize that our first responsibility in public relations is to do everything we can to make hospital service of high quality, safe, efficient and humane. Then let us take opportunities to discover the public's desires and to satisfy them insofar as possible. Having done everything in our power to make the service good, why not let the public in on the secret that the service is good by telling people as we meet them?

Left to right: Esther C. Myers, newly elected President of the Southeastern Assembly of Nurse Anesthetists; Mrs. Ida Tedford Ellis, re-elected Secretary-Treasurer, and Mrs. Rosalie McDonald, retiring President

SOME HISTORICAL FACTS OF SURGERY

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Read at the seventh annual meeting of the Ohio Association of Nurse Anesthetists, held in Columbus, Ohio, April 3, 1940.

I thought it might be interesting to discuss some facts in the chronology of surgery because many people erroneously believe that surgery originated only in the last century or so. While it is true that in England, surgeons became separate from the barber-surgeons only within the last two centuries, nevertheless there were surgeons in the middle ages, in the early days of the Christian era, and even in prehistoric times.

One of the earliest operations consisted of trepanning, or trephining, or making an opening into the skull. Most of us think that brain surgery is very recent and indeed it is, having its beginning only a little more than fifty years ago. Yet ancient skulls have been dug up that show evidence of healing so that some at least survived the operation. This procedure may have been done to release evil spirits, or for epileptic or similar attacks, and it shows that our forebears localized some conditions as arising in the brain. The instruments, flints, et cetera, with which these operations were performed have been recovered also and modern surgeons using these ancient tools have been able to make an opening through the skull in thirty-five to fifty minutes.

Another operation, or rather a condition for which operation was performed, viz: aneurysm, also goes back many centuries. The earliest operation described is named after Antyllus, who was a contemporary of Galen (131-201 A.D.), and which was the one usually performed until John Hunter described his operation in 1785. No improvement in the surgical treatment of aneurysm was made from that bleak December day when John Hunter first ligated the femoral artery, proximal to an aneurysm, through normal tissues, in what later came to be known as Hunter's canal, for the cure of a popliteal aneurysm, until 1903 when the late Dr. Rudolph Matas of New Orleans described his operation of endo-aneurysmorraphy, of both reconstructive and obliterative types. It is true that the French claim Anel antedated Hunter by 75 years but he ligated the popliteal close to the aneurysm and probably emptied it, if he did not incise and evacuate the sac.

In this connection we might mention something about syphilis. There is a theory that it was unknown among the ancients and first made its appearance in Europe when Columbus' sailors returned from the New World, and spread it through Spain, whence an invading army infected Naples. From this point it rapidly spread through Europe and at this time was much more virulent than it is at present. Against this assumption are: (1) the operation of Antyllus. It is a well known fact that lues plays an important role in the etiology of some aneurysms; (2) certain ancient bones have been dug up which show evidence of syphilis; and (3) writers, such as Horace, who was a farmer and author and not a doctor, have described lesions which may have been syphilitic, although they may not have been.

Although Ambroise Paré (1510-1590) who is said by Garrison to have been one of the three greatest surgeons that ever lived, is generally considered to have invented the ligature; Rufus of Ephesus, who lived in the reign of Trajan (98-117 A.D.) described all known methods of hemostasis; digital compression, styptics, the cautery, torsion and the ligature. However, we owe its re-introduction to Ambroise Paré. Herniotomy was known to the ancient Romans, but was put upon a more or less surgical basis by Paré, who advised against castration as part of the operation, and by Sir Astley Cooper's treatise in 1804. Practically no more improvement was made until about our own time, when Bassini in 1903 published his operation.

The modern operation for carcinoma of the breast was devised in 1894 independently by Halstead of Baltimore and Willy Meyer of New York, but it is not as modern as we think. Celsus, who lived from 30 B.C. to 38 A.D., in his masterpiece says it is not necessary to remove the pectoralis muscle, so we can assume with a fair degree of accuracy that this point was under discussion at that early day.

While it is said that Caesarean section was known to the ancients, mostly because some people, with a meager knowledge of Latin, think it is named thus because Julius Caesar was so delivered, there is rather documentary proof that it was done in the 16th century by a sow-gelder on his own wife. I have been told recently that it is mentioned in a manuscript of the 11th century; that a woman, in labor for a long time, slashed her own belly wall and uterus, the baby was delivered, and a neighbor sewed up the wounds. The modern operation, so spectacular and greeted with so many ahs! is of very recent origin. In the same century another sow-gelder did a bilateral ovariotomy on his own daughter. But the operation really dates from 1809 when Ephraim McDowell of Danville, Ky., first performed it. This is really the beginning of abdominal surgery. McDowell performed the operation thirteen times with eight recoveries. This is rather a high mortality but remember it was before the days of anesthetics, and also before the introduction of asepsis. Most of the deaths occurred from infection.

For this operation and for the daring that conceived it, Ephraim McDowell deserves a lot of credit. He was educated in Edinborough, it is true, but he was a backwoods surgeon on the American frontier nevertheless. He was a devout Episcopalian and believing apparently "the holier the day, the holier the deed," he deliberately chose Christmas Day, which that year fell on Sunday, for his task. Strapping the patient to a table, for it was before the introduction of anesthesia, and offering a prayer to God for assistance, he made a wide incision and removed an ovarian tumor weighing twenty-two and one half pounds. The operation consumed thirty minutes and in twenty-five days the patient was entirely recovered. McDowell wrote a description of the case to Dr. Bell, his former teacher, but he was away at the time and never received the letter. A few years later another pupil of Bell's made public this epochal advance.

So much for McDowell, but who was the patient, who risked so much, her life? She was Jane Todd Crawford, a woman of forty-seven, who rode sixty miles on horseback to undergo this ordeal and who lived

to enjoy thirty-one years more of life. Although she is buried in Graysville, Ind., a monument has been erected to her memory at Danville, Ky., probably the first time a memorial to a patient has been erected by a Medical Society.

The next step in a chronological history of surgery is anesthesia. Opium and other drugs were known to the ancients but they were unsatisfactory. Anesthetic agents—ether, chloroform and nitrous oxide, were introduced in 1842, 1846 and 1847, and these took away the terrors of the operation to a great extent. Further steps have been taken in more recent years by the discovery of spinal and local anesthesia, ethylene, cyclopropane, et cetera.

But the greater boon was to come. Louis Pasteur, the great French chemist and holder of an honorary M. D. degree from the University of Bonn, which he returned at the outbreak of the Franco-Prussian war, may be said to be the founder of bacteriology, and to have proved that disease is caused by bacteria. Joseph, later Lord Lister, believed in Pasteur's work and adapted it to surgery. He sprayed carbolic acid over the field of operation to kill the bacteria therein. This cut down the death rate appreciably. This was antisepsis. When we see illustrations of the complicated apparatus, read descriptions of Lister's meticulous care in preparing dressings, and imagine everybody with the odor of phenol about them, we are inclined to laugh, but it changed the outlook of patient and doctor and nurse. This marked the death knell of laudable pus, of wound diphtheria, of hospital gangrene. It changed a hospital from a place to which an individual went to die, to a haven of recovery.

This was later to be replaced and improved by asepsis, or the prevention of bacteria entering the wounds. This was the last step. It again cut the mortality and also the morbidity. But it did still more. It opened up more fields for surgery—the cavities of the body, the cranium, abdominal and chest cavities, the joints and the male and female pelvis.

It is of interest to note some outstanding names and the dates of some first operations.

In 1710 Anel, the French surgeon, did a proximal ligation for aneurysm. In the same year Morand and LeDran did the first disarticulation of the shoulder joint.

In 1849, Sedillot, a Frenchman, did the first gastrostomy.

Billroth, the great Viennese surgeon (1829-1894) is known for his surgery of the alimentary tract. In 1871 he did the first successful resection of the pylorus for cancer. In 1872 he resected the esophagus.

Von Volkman in 1878 was the first to excise the rectum for cancer.

Wölfler in 1881 did the first gastroenterostomy.

The history of gallbladder surgery is interesting. The first gallbladder operation which I have ever seen noted, was done by a medical student who took one out of a dog and the dog lived. I do not know when it occurred but it was done by a medical student at Leyden. However, on June 15, 1867, in Indianapolis, the first gallbladder operation on a human was performed by Dr. John S. Bobbs, that is, a deliberate gallbladder operation, a cholecystotomy. The gallbladder was incised and several stones removed and the woman lived for several years but had digestive symptoms which we now associate with chronic cholecystitis. The first deliberate cholecystectomy was done in 1882 in Germany.

In 1886 Reginald Fitz of Boston described acute appendicitis. Dr. John B. Murphy was one of the first to operate for this condition and wrote a monograph on the disease. Great was his delight and also his satisfaction when a patient, named Monahan, in his ward for something else, developed an acute appendicitis while lying in bed. Greater still was his joy, when he operated and removed a non-ruptured appendix, a few hours after the inception of the inflammation, and saw the patient go on to an uneventful recovery.

Dr. Murphy started some, but revolutionized many branches of surgery. His name once more is in the news because of the recent publication of his life. Wm. J. Mayo once wrote: "As a teacher of surgery by word of mouth, Dr. Murphy had, in my opinion, no equal." "As an author, he was widely known and honored in many lands. He was also an inventor and pioneer in surgical research, both clinical and laboratory, for he struck out new paths and opened new fields. We need only refer to such subjects as ileus, peritonitis, intestinal anastomosis. the surgery of the nerves, of the lungs, and the repair and reconstruction of bone, to be reminded that in each and all of these he led his colleagues into new fields of progress that will forever be identified with his name." [1]

"With the boldness of genius he invaded new avenues in surgery, none of which has been abandoned by his fellow-practitioners. His early work was done in abdominal surgery, to which period we owe the Murphy button, an epoch making invention in the surgery of the intestines. To him belongs the credit of the first successful end-to-end anastomosis of an artery in the human subject, and his also was the original suggestion, when the circulation was to be reversed, of providing two channels instead of one for the arterial blood, by doing a lateral anastomosis instead of an end-to-end union. His contributions to the surgery of the nervous system and his more recent researches in that of the bones and joints are among the most important of his time. To the initiated his work of grafting cartilage and replacing bone tissue was marvelous; to the layman it seemed nothing short of miraculous. His wonderful work in the restoration of ankylosed joints has been most striking, not to say beneficial. It may be said that he made the lame walk and the blind to see. But his most noteworthy outstanding achievement, and the one which has rebounded more than any other to his fame at home and abroad, is the introduction of the method of saline infusion in the treatment of peritonitis. The far-reaching value of this innovation as a life-saving measure cannot well be overestimated. It has been found indispensable in every hospital and to every surgeon the world over, and will remain so until perhaps another Murphy arises to give us, if possible, something better; yea, it has made Murphy's name a household one in every hospital throughout the world." [2]

I cannot close without mentioning at least two other names. The first is Cooper—Sir Astley Paston Cooper—a great surgeon and a great anatomist. He wrote one of the first treatises on hernia and also one on the mammary gland. It is to Cooper that we owe the passage of the Anatomy Act of Great Britain, after which are modelled the various ones

[1] Dr. E. Wylls Andrews.

[2] Dr. John B. Deaver.

in this country, by which Medical Schools are legally permitted to obtain bodies for dissection. Before his time they were obtained by grave robbing, ordinarily by people of rather low levels of society, but who, nevertheless, were called resurrection-men because they believed and put into practice a premature resurrection.

Astley Cooper was the first to ligate the common carotid artery, which he did in 1808. The first patient died, but undismayed, a few years later he repeated the operation and this patient lived. In 1817, however, he showed his daring by ligating the abdominal aorta, the main artery of the body. This patient died after forty hours, from the effects of the operation.

While Astley Cooper was the first to ligate the abdominal aorta and deserves full credit, the first to ligate it and get away with it was my old teacher, chief and, if I may add, without too much egotism, friend, the late Dr. Carl A. Hamann, for eighteen years Professor of Anatomy at Western Reserve University and for eighteen years subsequently Professor of Applied Anatomy and Clinical Surgery at the same institution. He ligated the aorta and the patient died six months later, ironically enough, from repeated hemorrhages from a bed sore on his back that antedated the operation.

NOTES ON PHYSIOLOGY

THE BLOOD

Anatomy of the Peripheral Vascular System

The arteries and veins down to their finest divisions are tubes which carry blood to and from the capillaries. The *arterioles* deserve special mention. The arterioles, which are the smallest divisions of the arteries, are endothelial tubes with circularly disposed smooth muscle cells that can control, by contraction or relaxation, the cross section of the arteriole. The larger arteries also have layers of smooth muscle cells circularly disposed, but contraction of these segments does not control flow to the extent that contraction of arterioles does. At maximal contraction the arteriole is practically closed, and as the muscle cells relax increasing amounts of blood are allowed to flow from the arterial system into the capillaries. The arterioles, through the circular smooth muscle cells, are under the control of the nervous system, being innervated by subdivisions of the *autonomic* nervous system, and under the control of humoral agents, such as adrenalin. The arterioles are frequently referred to as the "stop cocks of the arterial system," since the combined cross section of all arterioles is the principal factor, in addition to the pressure of the arterial blood, that determines the rate at which blood flows out of the arterial system and into the capillaries. Each arteriole supplies blood to a number of capillaries, there being many times more capillaries than arterioles. Wiggers states that a cross section of skeletal muscle the size of a common pin has 200 muscle fibers and 700 parallel capillaries. Probably not one-half dozen arterioles would be found in a section of this size.

The capillaries are endothelial

tubes varying in diameter up to three times the diameter of a red blood cell. In some tissues the capillaries are not round tubes but irregularly shaped spaces referred to as sinusoids; a good example of this is found in the liver. Active contraction of the capillary wall is controversial. The capillary walls are semipermeable membranes which bound a large extent of the vascular system and across which the transfer of water, salts, products of digestion and metabolism of foods takes place into and out of the vascular system. The great extent of the capillaries is difficult to picture. Krogh has estimated that each cubic centimeter of blood in the capillaries is in contact with 5600 square centimeters of capillary endothelium. The distribution of substances across this membrane must follow the physical principles outlined in the first lecture. *

The blood is a fluid tissue consisting of a variety of cellular elements suspended in a fluid medium, the plasma. Of the cells there are the erythrocytes containing the hemoglobin, a large iron-containing protein molecule which is held within the erythrocyte, whose intact cell membrane is impermeable to this large molecule. In addition there are the white cells, with many functions in their none too well understood rôle in the mechanism of tissue immunity against infection. There are also the platelets with their rôle in blood clotting.

Blood Volume

One of the first questions to arise in the curious mind perhaps would be, what is the relative volume of the circulating blood and of the vascular system and how is the blood volume regulated. Physiologists have attempted to measure accurately the volume of the circulating blood but this has not been easy. However, approximations have been obtained. Probably the simplest method one could devise would be to determine the total amount of hemoglobin that is in the body by first bleeding an animal, then washing out as much additional hemoglobin as possible, and from the total hemoglobin calculating the original blood volume. This is the Welcker method.

Another method, introduced by Keith, Rowntree and Geraghty, consists of injecting a dye into the blood stream, allowing sufficient time for mixing of the dye with all the blood serum and then measuring the dilution of the dye in the serum. The ratio of cells to serum can be obtained from the hematocrit. This can be done in the intact animal and has been done in man. This method is open to the criticisms that only a small fraction of all the body capillaries and sinusoids are functioning at one time, making it difficult to obtain rapid, uniform mixing of the dye with the plasma, and also that while the mixing is taking place some of the dye is lost from the plasma escaping into the blood cells and out of the vascular system. However, by using methods such as this, it has been established that the blood constitutes 7 to 10 per cent of the body weight, the average being given as 8.8 per cent. Of the whole blood the cell volume normally constitutes 40 to 45 per cent, the red cells occupying about 99 per cent of the cell space.

If we consider the total number of red blood cells and hemoglobin in the vascular system as remaining constant over short periods of time, we can use the red cell count and hemoglobin content of the blood as a measure of change of plasma volume. If

* Published in February, 1940, Bulletin, pp. 35-38.

the plasma volume is decreased, there will be an increase of the cell count and hemoglobin content per unit volume. This is referred to as *hemoconcentration.*

Variation in Blood Volume—Hemorrhage and Shock

The maintenance of an adequate volume of circulating blood is extremely important to the surgeon and anesthetist. The fact that a patient can tolerate considerable loss of blood and yet maintain an adequate blood pressure suggests that there are compensatory physiological mechanisms to restore the blood volume.

With sudden large hemorrhage the arterial blood pressure falls abruptly to a low level. This leads to the following: (1) There is stimulation of those parts of the brain that help regulate blood flow and the peripheral arteries and arterioles are constricted, making the volume of the vascular system smaller and preventing the flow into the capillaries. This vasoconstrictor reflex diverts blood from the skin and extremities to the brain and heart. The vasoconstrictor reflex causes very little, if any, vasoconstriction in the arterioles of the brain and heart. (2) The pulse rate increases owing to a removal, by nervous reflex, of the normal inhibition of the heart rate by the vagus nerve. (3) Respirations are increased in rate and depth. (4) The spleen contracts, discharging stored red blood cells into the circulation. (5) There is a transfer of tissue fluid across the capillary membranes which tends to restore the blood volume. This occurs more slowly than the other mechanisms. During this period of time the hemoglobin and red cells and plasma proteins remaining become *diluted.* If the patient is conscious, an intense thirst develops. If fluid is taken by mouth, this may be rapidly absorbed and help restore body fluids and further dilute the blood. (6) The bone marrow is stimulated and young red blood cells begin entering the vascular system at an increased rate. Nucleated red cells may appear in the peripheral blood. A leukocytosis develops rather promptly after a severe hemorrhage.

The changes associated with uncomplicated hemorrhage are not difficult to comprehend, but a condition which has been referred to as surgical shock has been very puzzling for a long time, since many of the characteristics of severe hemorrhage may be seen without external loss of blood.

We may best introduce the question of shock by mentioning something about the manifestations of a patient in surgical shock. A young healthy adult is brought to the hospital with a severely crushed leg, without external lacerations, showing that there has been no external blood loss. If arterial blood pressure determinations had been made at the time of the injury, it is quite likely that there would have been noted an abrupt drop of mean arterial pressure with a return to near normal after a brief period of half an hour or so. Assuming that it would take several hours to get this patient to a hospital, on admission the patient would very likely have a peculiar pale, ashen gray color with at times slight cyanosis. The skin is moist with perspiration, that of the extremities being cold and clammy. The patient is restless and later may become dull and apathetic. He may have severe thirst. There may be nausea and vomiting. Further examination shows rapid, shallow respirations, a rapid pulse, blood pressure showing a systolic reading of 70 millimeters of mercury or less, diastolic

level not perceptible, and temperature below normal.

In spite of warming the body, giving blood transfusions and drugs to raise the blood pressure, administering sedatives, and splinting the injured extremity, et cetera, the patient becomes progressively worse and dies in from 12 to 18 hours after the accident. In attempting to explain the sequence of events in such a patient, many theories have been propounded, some of the earlier ones being the most fantastic. Some of these will be mentioned.

I. Nervous Exhaustion Theory

The vasomotor center becomes fatigued leading to dilatation of the arterioles and pooling of the blood in the capillaries and veins of the splanchnic area. The difficulty with this has been that the arterioles are not dilated but on the contrary are constricted, and no one has ever demonstrated the imaginary accumulations of blood in reservoirs within the vascular system.

II. Adrenal Theories

1. Removal of adrenalin from the circulation may be responsible for the low blood pressure and dilatation of the arterioles. Here again experiments show: (a) The arterioles are *not* dilated; (b) There is no change in the adrenalin content of the blood, and (c) Even if the adrenalin of the adrenals is excluded from the blood, no fall in blood pressure occurs.

2. Excessive liberation of adrenalin may be responsible for shock, but the quantities necessary to do this are far in excess of what would be excreted by a single pair of glands.

3. A similarity has been noted between patients suffering from surgical shock and patients suffering from inadequate amounts of the hormone of the adrenal cortex, and it was therefore supposed that surgical shock is due to acute insufficiency of the adrenal cortex. However, the complete removal of the adrenal cortex does not give rise to symptoms of cortical hormone deficiency for several days. It is difficult to conceive how symptoms could be brought on in a shorter length of time. It is quite true that patients with Addison's disease that have diminished cortical hormone are far more susceptible to develop surgical shock because in some way they cannot compensate for the changes that lead to shock, but this alone does not prove that an excess of the hormone would make the body better able to prevent the development of shock.

III. Traumatic Toxemia

This supposes that as a result of tissue injury toxic substances are formed that get into the general circulation. It was suggested that a histamine-like substance was liberated as a result of tissue break-down. More recently it has been suggested that potassium may be the toxic substance, since increased blood potassium was found in some cases of shock. At present the rôle of toxic substances remains controversial.

IV. Hemoconcentration Theory

This brings us back to the significance of change of blood volume due to loss of plasma water. This is the only concrete finding in surgical shock consistently found by a number of workers that may explain the mechanism to a large extent. Before the blood pressure falls, the hemoglobin content and red cell count rise, indicating loss of water from the blood. As the blood pressure falls and shock becomes established, the concentration of cells and hemoglobin continues to increase. With this concentration of the blood the vis-

cosity increases significantly and this with the lowered pressure results in a poor capillary circulation which leads to injury to the capillary endothelium. This injury to the capillary endothelium may become quite widespread throughout the body as shock progresses. The resulting circulation in vital centers of the brain presumably initiates the vasomotor reflexes referred to earlier, as a result of allowing carbon dioxide and other metabolic products to accumulate around the nerve cells, and as a result of this change in environment, as pointed out earlier, the nerve centers are stimulated. The nervous manifestations are those *secondary* to the circulatory change. The remaining question that should be answered is: Where does the water go that is lost from the blood? The studies indicate that the fluid goes into the traumatized tissues causing edema, or into the body cavities as exudates. Such exchange can rapidly cause a *net* loss of a liter or two of fluid from the vascular system without much external evidence of the loss as would be the case if the patient suffered from a hemorrhage of similar proportions. Following damage, due to poor circulation, to the capillary endothelium in regions remote from the trauma, edema may develop in other tissues. Edema of the lungs is a constant finding when surgical shock is the cause of death.

One further word must be said about the reversibility of such processes. We see very few deaths from surgical shock in spite of the fact that some degree of shock is very common. However, when the condition progresses beyond a certain ill-defined stage, the patient dies in spite of everything that may be done. The lesson here is that fluid, blood, sodium chloride, in general good preoperative preparation of patients, are worth more in *preventing* shock than they are in the treatment of severe shock once it is established. Blood changes in the direction of surgical shock are produced by ether anesthesia alone.

There is considerable controversy as to whether disturbances of shock and hemorrhage are the same or different. From the foregoing discussion it should be clear that the end picture clinically may be very much the same whether there is only loss of plasma on the one hand or whole blood on the other. However, in the majority of cases the end result is generally a combination of both.

Blood Coagulation

If it were not for the great facility with which capillaries, arterioles and venules are sealed by the process of blood clotting, there would be little work for either the surgeon or the anesthetist. In making a wound, only the relatively large blood vessels in the field need to be ligated, and in most cases even these would be closed by thrombosis before fatal exsanguination occurred.

The process of blood coagulation is rather complicated and depends upon the interaction of a number of constituents of the blood. The stages of the reaction are designated as follows:

(1) Prothrombin + thrombokinase + Ca = Thrombin

(2) Fibrinogen+thrombin=Fibrin

Prothrombin is a protein of unknown composition which normally is in solution in the blood plasma. The prothrombin is normally in combination with an inhibiting substance called antiprothrombin thought to be the same as heparin. This combination is broken or the antiprothrombin is neutralized by a factor present

in high concentration in tissue juice; this factor is referred to by a number of names—thromboplastin, thrombokinase and others. When the prothrombin-antiprothrombin combination is broken up, prothrombin is activated by blood calcium to form thrombin. The thrombin reacts with fibrinogen, another protein in solution in the blood plasma, to form fibrin threads which form the basic network of a blood clot. The nature of the chemical conversion of fibrinogen to fibrin suggests that thrombin plays the rôle of an enzyme.

Thus coagulation is delayed or prevented by the following:

(1) Absence of calcium. This is a common way of preventing clotting in vitro; sodium citrate or oxalate added to blood reacts with the calcium to form an insoluble calcium salt. In life there is never such a degree of calcium deficiency as to cause delayed clotting.

(2) Thromboplastin is present in platelets and there is impaired coagulation when platelets are greatly reduced in number, as in thrombocytopenic purpura, and when the platelets do not readily liberate their thromboplastic substance, as in hemophilia.

(3) If the prothrombin is low, the clotting mechanism is delayed. It has recently been shown that bile salts in the gastrointestinal tract, functioning liver, and a substance which has been referred to as vitamin K are all necessary in order to maintain a normal level of prothrombin in the blood. This mechanism causes impaired clot formation in prolonged obstructive jaundice.

(4) An excess of the antiprothrombin or heparin will delay clotting. This was discovered by Howell and recently heparin has been prepared as crystallin barium salt by Best of Toronto. This has been used by continuous intravenous injection in order to prevent thrombosis after operations upon the arteries and in situations in which pulmonary embolism is likely to occur.

(5) Decreased blood fibrinogen, the final link in the coagulation process, may be responsible for abnormal bleeding. Since fibrinogen is formed in the liver it may be reduced in chronic liver disease.

Regulation of Acidity of the Blood

The mechanism of regulation of pH was previously mentioned. There are several buffers in the blood. These will be discussed in order of their importance.

(1) $\frac{HHb}{BHb}$ The hemoglobin fulfills the requirements of a buffer in that it is present in solution with the red blood cells, partly as a weak acid and partly as a salt, as for example, potassium hemoglobinate. B in the formula is any basic ion as K or Na. There are about 500 to 700 grams of hemoglobin in the body, and this is one of the most important blood buffers.

(2) $\frac{H_2CO_3}{NaHCO_3}$ This buffer was discussed previously. Addition of acid results in liberation of CO_2 from the lungs; addition of alkali causes CO_2 to be retained.

(3) $\frac{BH_2PO_4}{B_2HPO_4}$ When HCl is excreted into the stomach from the blood, B_2HPO_4 may be excreted by the kidney. This is the mechanism of the alkaline tide of the urine that follows the ingestion of a large meal.

(4) $\frac{H\ Protein}{B\ Protein}$ The plasma proteins are only of minor importance as blood buffers but act just as the hemoglobin.

The buffers prevent extreme deviation of blood pH even though con-

siderable amounts of acid or alkali are added. The buffers hold the *degree* of acidity within close limits, while the kidney excretes excessive *amounts* of either basic or acid substances. The blood also retains or eliminates carbon dioxide through the lungs as indicated. With this brief discussion of acid base balance as an outline the more extensive discussion of the subject in the textbooks should be studied. F.R.M.

INTRODUCING THE DEPARTMENT OF EDUCATION

"The highest object of the critical faculty is not to censure faults, but to disengage excellencies. * * * The basis of criticism is imagination, its spiritual quality is simplicity and its intellectual distinction is balance."

It is my pleasant privilege to introduce to the membership, the new "Department of Education," and to outline as clearly as I can, its function, scope, and objectives.

As the title implies, a program of teaching, it may be rightly assumed that the primary function of this department will be to publicize the teaching activities of the American Association of Nurse Anesthetists, as developed by its Education, Correlating Committee, which committee is to be responsible for selection and arrangement of such teaching material as will appear in future issues of this department.

An important contribution, already made in the form of a published inclusive curriculum, will provide a framework, upon which to elaborate further progressive patterns of instruction. With this object in view, the present curriculum is now undergoing revision, and one of the, to be, expected early contributions will be this revised edition. As new developments take place in anesthesia, the accepted pattern of education will evidence the progress.

Discussion of the curriculum naturally leads to consideration of schools of anesthesia, and invites comparison of curriculi of such with our present standard of education. In order to do this effectively, the American Association of Nurse Anesthetists, through its Educational committee, is arranging a survey of listed schools of anesthesia; the object of which shall be to obtain first hand information as to the educational facilities of same, relative to education afforded the student nurse anesthetist. It is the hope of the education committee that this initial survey will be regarded as a form of educational conference between school heads and appointed visiting advisors, and as such will yield: enlightening data on the needs of schools; constructive criticism on our present curriculum, and concrete suggestions as to how best the schools can be served through this Department of Education.

A questionnaire, covering the information required is an essential part of this survey and a study of data thus acquired will greatly aid in formulating a system of instruction which will adequately cover the educational content of the program planned.

The scope of this program will include a series of articles on the physiology of respiration, circulation and nerve function as related to anes-

thesia. It will also elaborate in teaching articles the educational content of the accepted curriculum.

The function of this program will be threefold; first—that of providing to schools a uniform approach to curricular contents, thus standardizing the education given the student; second—by presentation of current material, in teaching form, keep the education of the student in pace with progress made in anesthesia; third—publication of this teaching material will not only provide continuity of instruction but will make the "Bulletin" still more valuable and permanent as a reference journal on teaching activities. As the value of certain articles, as teaching guides, becomes apparent, it is hoped that such will be re-edited by the Correlating Committee, and reprinted by Publishing Committee, in more convenient form for use by school instructors.

With the foregoing in mind, we now approach discussion of benefits accruing to schools, from this educational plan. The first of these will be to bring the school into prominence, as an important part of our organization. This is as it should be, because from whatever angle the subject is considered, the school remains the repository of our hopes, the guarantee of security for our association. Perpetuity of nurse anesthetist service depends in large measure upon the soundness of preparation given the student, and this in turn depends on the excellence of the school, which educates and graduates her into the practice of anesthesia. It is therefore emphatically our duty and greatly to our interests, as an association, to direct every effort towards raising the educational level of school instruction, and devising new measures to constantly improve the type of teaching given the student.

It is hoped that the American Association of Nurse Anesthetists will, in due time, through its education committees, encourage and foster the organization of teaching institutes and extension courses, as a means of additional preparation to instructors engaged in teaching anesthesia.

The advantage of this will be readily seen in regard to another function of this department, namely—that of a forum for the exchange of opinions, among school instructors, on teaching problems. We will all agree that instituted plans to broaden the intellectual life of the teacher, are of benefit to the group as a whole, inclusive of the student body.

Discussion of our next topic, the education of the student nurse anesthetist, brings us to the heart of this whole matter, revealing the raison d' être of our teaching program, epitomizing our future aspirations and hopes; because the student body of today becomes the membership of the future, and in the hands of the membership lies the destiny of our association. It would seem, therefore, that any educational plan which integrates cultivation of spirit with scientific training of mind, and skill of hands, will be richly repaid in the golden coin of good membership. I am trusting, therefore, that with "learning" the student will be given understanding—a perception of spirit which will make very real to her, that the most valuable and permanent thing in her life is realization of the importance of the service she is privileged to give. This will be to her a sustaining force, a light upon the unknown way.

No education program is complete which does not have in its content, consideration of the question of scholarships, and money grants, for extra curricular studies, made avail-

able to the gifted and ambitious student. While such may not be immediately considered, it is a question which appears on our educational horizon, as one to be fostered if the American Association of Nurse Anesthetists is to take a desired place as a teaching force among other professional organizations.

I am hoping that each school, however small, will form its own alumnae association, concerned with accomplishing, in large or small measure, the recognized traditional and valuable function of such associations, namely, that of advancing their school by contributing to the educational progress of its student body.

Later as the membership becomes —shall we say—"student conscious," we will, I believe, see efforts of alumnae associations complemented by contributions from state associations to schools located in their particular states.

Let us visualize what we may confidently expect, in the future, from this awakened interest in student education. First—the membership becomes conscious there are gifted students and that such are of great potential value to the organization; second—these scholarship gifts will make it possible for chosen students to do directed research work, and this will constitute a real contribution to the educational life of the association; third—the publication of such contributions as are deemed worthy, will demonstrate in practical fashion, the excellence of the preparation given the student; fourth—realization of the future contributing value of students, so prepared, as leaders and teachers—a potent factor in making more secure continued execution of the educational program.

This is forward vision, but in such mental preparedness lies the hope of being able to meet developing issues, inherent to progress, not on the ground of expediency or what any one group, however well intentioned, may advocate, but on the firm basis of how efficiently any proposed measures will advance the educational program and make it secure for the future. When every member of the organization begins to think in such terms, and makes thinking a reality by action, we will see the results of this intellectual process, evidenced in well informed, vital state associations, cooperating to bring about effective coordination between state plans and national projects—a long step forward towards making the American Association of Nurse Anesthetists a truly great association.

To summarize briefly; any criteria evolved, for guidance of policy, should include a proviso that the program of activities be kept consistent with the defined function of this Department of Education, namely; by the study of, and exercised discrimination in, selection of material from current literature and chosen contributors, keep the curriculum of the American Association of Nurse Anesthetists concurrent with progress made in anesthesiology; by release of this material through these columns act as a directive agency in assisting schools, to keep their curricula in harmony with the standards of the American Association of Nurse Anesthetists. To give aid on teaching problems and indicate such teaching methods as will help instructors illuminate the subject matter to students. To release by publication, as occasion demands, the sanctioned policy and plans of the American Association of Nurse Anesthetists as related to its educational teaching program.

Although the above indicates briefly the function of the Department,

there are broader implications in carrying it out involving the finer qualities of spirit and intellect, which must, if true success is to be obtained, be adhered to. It was with the hope of emphasizing qualities which, if incorporated into, would give permanence and vitality to the program —that led to my choice of the foreword quotation.

As you will perceive, its first condition implies the use of discrimination and tolerance, an ability to disengage or set free, such excellencies of material as will illuminate the subject; tolerance and conservation of energy in passing over without censure, that which is faulty or not useful to the purpose in hand.

The second condition postulates that before practical expression comes mental vision, the ability to see with the eyes of the mind (imagination) the picture as a whole, not in part. Success in an undertaking depends on how clear the mental picture of it is; its practical fulfillment depends on the degree of skill used in fitting component parts into the picture, in such a way as will bring about an harmonious attainment of objectives.

The next quality reveals the essence of constructive criticism—simplicity. This spiritual quality contains within itself inner illumination of spirit, singleness of purpose, the gift of clear expression, and by its very nature gives strength, endurance, patience, and courage to the individual or the group fortunately possessing it.

Lastly, the stabilizer of the other qualities of criticism—balance. This distinctive intellectual faculty of weighing, judging, and deciding with discriminating perception of the sequence of cause and effect is the balance wheel which keeps in proper adjustment each part of the plan, in proportionate importance to the project as a whole. Constant appreciation of the fact that a well-balanced program—one placing emphasis on important objectives—is an essential factor in creating confidence in and success of, the undertaking as a whole; will insure, from those responsible, considered, careful judgment in the formulation and execution of plans.

There must also be realization of another fact, if this project is to have the success we all so ardently desire for it, namely, the vital need of loyal support and understanding appreciation, by the membership, to the committee undertaking this difficult and exacting task. This now inaugurated Department of Education represents the educational teaching program of the American Association of Nurse Anesthetists, and the success of *that* is the deep concern of every member of the organization. It is *our* responsibility as well as the committee's.

A music commentator remarked, in a recent radio broadcast, that in reading over a certain orchestral score by a famous composer, there were found written on the margin of a crescendo movement these words, "as loud as possible"; further on was written "louder still." Translating this into the work of the Department of Education, I would like to see written on the margin of its program "the best possible," and further on, "better still." On this high note I close my presentation.

Agatha Hodgins

ACTIVITIES OF STATE ORGANIZATIONS

CALIFORNIA

The California Association, which has steadily gained in membership, interest and enthusiasm since its reorganization in 1935, held the annual meeting on March 5, 1940 at the East Oakland Hospital, Oakland, Calif.

Plans were discussed for the joint meeting on April 9th with the Western Hospitals Association, and following the business meeting a supper was served.

Officers elected:

President	Martha Bichel Franklin Hospital, San Francisco
Vice-President	Mary Johnson 184 - 13th Street, Oakland
Secretary-Treasurer	Marian L. Lagan 5 Prado St., San Francisco
Trustees:	
One year	Gladys M. Bolton
Two years	Mary J. R. Stevenson
Three years	Olga E. Schreiber

Committees

Membership:	May Malamphy, Chairman Eva M. Wilson Louise Grunewald Johnson
Program:	Myra Belle Quarles, Chairman Nan Snodgrass Anna K. Bishop
Revisions:	Martha M. Guptill, Chairman Evangeline M. Clutton Jean H. Pray
Nominating:	Katherine Keenan, Chairman Nan Snodgrass Irma Wilkinson

On April 9th the California anesthetists held a well attended joint meeting with the Western Hospitals Association, at the Biltmore Hotel, Los Angeles.

The following papers were read:

"The Value of a Well Organized Department of Anesthesia"
Mr. R. D. Brisbane, Superintendent Sutter Hospital, Sacramento

"Explosive Hazards in Relation to the Administration of Anesthetics"
Mr. Thomas Dahm, Kelly-Keott Company, Los Angeles

"Oral Surgery Technique"—with motion pictures
Miss Sophie Jevne, Los Angeles

Following an interesting round table discussion a luncheon was held at the Bilmore Hotel.

COLORADO

The annual meeting of the Colorado Association of Nurse Anesthetists was held November 25, 1939, at the Presbyterian Hospital in Denver.

Three new members, including two transferred from other states, have been added during the year to this small but loyal group. They value greatly the bond of professional interest developed at these gatherings, in a section where frequent contacts are not possible because of the extreme distances between the larger communities.

Following the business meeting each member present contributed to a discussion of articles on anesthesia.

Ethel Currie, President

Officers elected for the year:

President

Ethel F. Currie
Presbyterian Hospital, Denver, Colo.

Vice-President

Elizabeth Hansbrough
Fitzsimons Hospital, Denver, Colo.

Secretary-Treasurer

Maxine Leonard
1630 Fillmore, Denver, Colo.

A meeting was held on February 24, 1940, at Mercy Hospital, Denver, at which the revised By-Laws of the American Association were read and approved.

LOUISIANA ORGANIZED AND AFFILIATED

The Louisiana Association of Nurse Anesthetists, which met concurrently with the Southeastern Conference of Nurse Anesthetists at Edgewater Park, Miss., March 28-29, 1940, has completed its organization and become affiliated with the American Association of Nurse Anesthetists.

Officers Elected:

President	Mary Koenig Charity Hospital, New Orleans
First Vice-President	Catherine Gomila Karrigan 7821 Hampson St., New Orleans
Second Vice President	Molly Seeberg U. S. Marine Hospital, New Orleans
Secretary	Evelyn H. Coco 3435 Louisiana Parkway, New Orleans

LOUISIANA (continued)

Treasurer	Mattie T. Word 1410 St. Andrew St., New Orleans
Historian	Mrs. Sam Owen Charity Hospital, Shreveport
Board of Directors	Margaret Price Lillian Gebs Katie Rolufs Graves Jeanne R. Manent

Committees:

Membership	Mattie T. Word, Chairman Jeanne R. Manent Katie Roluf Graves
Education	Esther C. Myers, Chairman Mrs. Sam Owen Sister Aubierge Younge
Program	Rowene Kling, Chairman Lena Pellesier Mertice M. Wever Evelyn H. Coco
Nominating	Lillian Gebs, Chairman Catherine Gomila Karrigan Agnes Grillet
Legislative	Molly Seeberg, Chairman Catherine Gomila Karrigan Margaret A. Price
Finance	Mattie T. Word, Chairman Rosalie G. Sullivan Ethel Trimble
Revision	Irene Epsky, Chairman Daisy B. Estelle Rosalie M. Forsman

MINNESOTA

The sustained interest and enthusiasm of the Minnesota group is evidenced by the consistently good attendance at the monthly meetings. The January meeting was held at Asbury Hospital, Minneapolis on the 30th, with Janet Kippen and Bernice Roadman as hostesses. Dr. Henry Hoffert's talk on local anesthesia was illustrated with slides.

On February 27th, the group met at St. Joseph's Hospital, St. Paul, with Marie Gronvald as hostess. Dr. H. Schwyzer spoke on "Anesthesia in the Army During War Time."

Grethe Westly, Palma Anderson and Selma Snobeck acted as hostesses at the meeting on March 27th at the Deaconess Hospital, Minneapolis. Reports were given by the various committees, and Elizabeth Hinkley of Northwestern Hospital, Minneapolis, read a paper on "Cyanosis in Anesthesia." A group of songs was rendered by three student nurses from Deaconess Hospital.

MINNESOTA (continued)

A second series of two lectures on anesthesia, each of two hours duration, was scheduled to be held at the Nurses' Club Rooms, Donaldson Building, Minneapolis, Minn. Dr. John S. Lundy, Chief of the Section on Anesthesia, Mayo Clinic and Professor of Anesthesiology of the Mayo Foundation, Rochester, Minn. was to discuss "Suggestions Concerning the Clinical Application of Inhalation and Intravenous Anesthetic Agents," and on Friday evening, April 19th, Dr. Ralph Knight, Assistant Professor of Surgery (Anesthesia) and Director of Anesthesia, University of Minnesota, was scheduled to give the concluding lecture—"Suggestions Concerning the Clinical Application of Rectal and Spinal Anesthetics."

Treasurer's Report

Cash in Bank February 1, 1940		$238.38
Receipts		
Dues	$230.00	230.00
		$468.38
Disbursements		
National Dues	$152.00	
Stamps	2.00	
Farnham Printing Co. (stationery)	11.50	165.50
Cash in Bank March 1, 1940		$302.88

PROGRAM

Sixth Annual Meeting

MINNESOTA ASSOCIATION OF NURSE ANESTHETISTS

Held in conjunction with the Minnesota Hospital Association at the Nicollet Hotel, Minneapolis, Minn.

MAY 24th, 1940

9:00 a.m. GENERAL SESSION

"The Nurse Anesthetist"
Palma Anderson
Deaconess Hospital, Minneapolis, Minn.

12:15 p.m. Allied Organizations Group Luncheon

BUSINESS SESSION—Junior Ball Room

Alice Anderson, President, presiding

2:00 Business meeting and election (for members only)

GENERAL SESSION

3:00 Greetings

A. G. Stasel, President Minnesota Hospital Association
Eitel Hospital, Minneapolis, Minn.

MINNESOTA (continued)
May 24th

3:15 p.m. "The Airway"
Lloyd H. Mousel, M.D.
Section on Anesthesia, Mayo Clinic, Rochester, Minn.

3:45 "Principles of Relationship Between Anesthetists and Hospitals"
Robin C. Buerki, M.D.,
Chairman, Council on Professional Practice,
American Hospital Association

4:00 "Prevention and Treatment of Atelectasis"
Ralph T. Knight, M.D.
Director, Division of Anesthesia
University of Minnesota, Minneapolis, Minn.

4:30 "Fire Hazards"
Glenn Rowell,
Fire Underwriters Inspection Bureau,
Minneapolis, Minn.

6:30 Banquet

For further information write Miss Dorothy L. Koch, Secretary, Minneapolis General Hospital, Minneapolis, Minn.

MID-SOUTH POST GRADUATE NURSE ANESTHETISTS' ASSEMBLY

The sixth annual convention of the Mid-South Post Graduate Nurse Anesthetists' Assembly was held at the Hotel Peabody, Memphis, Tenn., February 14-15, 1940, in conjunction with the Mid-South Post Graduate Medical Assembly. This important gathering, as always, drew a large attendance, and offered a full and stimulating program to those fortunate enough to be present.

The following papers were read:

"Anesthesia in Abdominal Surgery, Particularly for Operations on the Colon"
Henry W. Cave, M.D., New York, N.Y.
(published on page 61 this issue)

"Postoperative Complications Related to Anesthesia"
Richard B. Cattell, M.D., Boston, Mass.

"Anesthesia from the Viewpoint of the Urological Surgeon"
George Gilbert Smith, M.D., Boston, Mass.
(paper published on page 67 this issue)

"Intratracheal Inhalation Anesthesia"
Charles B. Olim, M. D., Memphis, Tenn.
(paper published on page 77 this issue)

"The Principles of Obstetrical Anesthesia and Analgesia"
Frederick H. Falls, M.D., Chicago, Ill.

"The Problem Presented to the Anesthetist and Surgeon by the Patient with Diabetes"
Russell M. Wilder, M.D., Rochester, Minn.

MID-SOUTH (*continued*)

"The Reflex Regulation of Blood Pressure"
Maurice B. Visscher, M.D., Minneapolis, Minn.

"Cyclopropane"
Alma Clyde Foust, Colbert County Hospital, Sheffield, Ala.

"Intravenous Anesthesia"
Arthur Porter, Jr., M.D., Memphis, Tenn.

"General Anesthesia in Cardiac Patients"
Roy W. Scott, M.D., Cleveland, Ohio

"The Value of a Good Anesthetist"
Quitman U. Newell, M.D., St. Louis, Mo.

"The Organization and Management of a Gas Therapy Department"
Esther C. Myers, Charity Hospital, New Orleans, La.
(published on page 81 this issue)

"The Influence of Some Anesthetics on the Liver"
Lay Martin, M.D., Baltimore, Md.

"Anesthesia from the Viewpoint of a General Surgeon"
Waltman Walters, M.D., Rochester, Minn.
(published on page 72 this issue)

A clinic was held on Thursday, February 15th, at the John Gaston Hospital, in charge of Dr. Charles B. Olim, with a demonstration of intratracheal anesthesia by Jacqueline Kooyman, Chief Anesthetist of John Gaston Hospital. The Mid-South and Tennessee State Association banquet was held at the Hotel Peabody, with Mayor Walter Chandler as guest speaker.

Alice M. Sims, President

Officers Elected:

President
Alice Maurine Sims
704 Goodwyn Institute, Memphis, Tenn.

Vice-President
Mazie L. Caldwell
919 E. McLemore, Memphis, Tenn.

Vice-President
Cordelia Hanna Hallett
Gamble Bros. Clinic, Greenville, Miss.

Vice-President
Martha Jenkins Hubbard
Cooper Clinic, Fort Smith, Ark.

Secretary-Treasurer
Zelda C. Holland
St. Joseph's Hospital, Memphis, Tenn.

MISSOURI

The Missouri Association of Nurse Anesthetsits met in conjunction with the Mid-West Hospital Association and the Mid-West Nurse Anesthetists' Assembly, at the Hotel Continental, Kansas City, Mo., April 11th and 12th, 1940.

Officers Elected:

President	Helen Lamb Barnes Hospital, St. Louis
First Vice-President	Regina Noon 4954 W. Pine St., St. Louis
Second Vice-President	Ineze Breitweiser Missouri Pacific Hospital, St. Louis
Treasurer	Mildred Hodges St. Luke's Hospital, St. Louis
Trustee	Jessie Lindsey 1468 Forest Park Blvd., St. Louis

NEW YORK

The seventh annual meeting of the New York Association of Nurse Anesthetists will be held at the Hotel New Yorker, New York City, on May 22nd, 23rd and 24th, 1940. Tentative program was published in the February, 1940 issue of the Bulletin.

Anesthetists from other states will be welcome at all sessions.

For further information write Miss Hazel Blanchard, President, 1910 Seventh Avenue, Troy, N.Y.

NEW JERSEY ASSOCIATION ORGANIZED AND AFFILIATED

The New Jersey Association of Nurse Anesthetists, recently organized, has become affiliated with the American Association of Nurse Anesthetists and officers have been elected as follows:

President	Della Logan Cooper Hospital, Camden
Vice-President	Florence V. Hale St. Peters General Hospital, New Brunswick
Secretary-Treasurer	Nancy M. Bowles St. Barnabas Hospital, Newark
Historian	Martha K. Glenn St. Peter's General Hospital, New Brunswick
Board of Trustees:	Nathalie Hill Leona Dangler Philomena Dutton Martha E. Lowery

Committees:

Membership	Alberta Sutton Emily M. Holcombe Pearl C. Patterson

NEW JERSEY (continued)

Revisions	Ora E. Thompson Eleanor R. Hawk Agnes P. Strandberg
Education	Ruth M. Nash Margaret M. Kehoe Elizabeth A. Dwyer
Legislative	Bebe M. Horwitt Harriet L. Aberg Helen F. White
Program	Mae Stone Marie Glick Phyllis Richardson
Nominating	Belle Loyd Harriet E. Reynolds Ruth M. Kropa
Finance	Gertrude M. Weaver Sister M. Benildis Schumm Mary P. Calden

OREGON

The monthly meetings in Portland have been well attended. At the February meeting, held at the Portland Sanitarium, Dr. Holden gave an interesting resumé of anesthesia. Ten new members have been accepted since the first of the year and several new applications received.

OHIO

The seventh annual meeting of the Ohio Association of Nurse Anesthetists was held at the Deshler-Wallick Hotel, Columbus, Ohio, on April 3rd, 1940.

Miss Miriam G. Shupp gave an interesting talk on the "Activities of the American Association of Nurse Anesthetists," and took part in the joint meeting of the group with the Ohio Hospital Association.

Miss Maria E. Guthridge, of Fort Hamilton Hospital, Hamilton, Ohio read an instructive paper on "Carbon Dioxide and Analeptics in Anesthesia"; and Dr. James E. Hallisy, of Cleveland, Ohio, spoke on "Historical Facts of Surgery."

The convention banquet with the Ohio Hospital Association was held in the Ball Room, with Dr. H. L. Rockwood, President of the Ohio Hospital Association, as toastmaster. Dr. Joseph C. Doane, Medical Director, Jewish Hospital, Philadelphia, spoke on "Human Relationship" and Dr. Joseph L. Davis—"Philosophy, Facts and Fun."

At the business meeting it was decided to change the fiscal year to close April 1st instead of September 1st.

OHIO (continued)

Officers Elected for 1940-41:

President

Miss Myrn E. Momeyer
St. Luke's Hospital, Cleveland

First Vice-President

Miss Daisy A. Parker
Youngstown City Hospital, S.S. Unit
Youngstown

Second Vice-President

Miss Romaine M. Stewart
People's Hospital, Akron

Secretary-Treasurer

Miss Mildred Sauers
City Hospital, Cleveland

Trustee: 3-year term

Miss Marian Hollister
University Hospitals, Cleveland

Myrn E. Momeyer, President

TENNESSEE

The annual meeting of the Tennessee Association of Nurse Anesthetists was held in Memphis, Tenn. February 14 and 15, 1940, in conjunction with the Mid-South Nurse Anesthetists' Assembly.

Miss Agatha C. Hodgins, founder of the American Association of Nurse Anesthetists, was made an honorary member of the Tennessee Association of Nurse Anesthetists.

The following officers were elected for the year:

President	Gertrude Alexander Troster 654 Stonewall Place, Memphis, Tenn.
First Vice-President	Mary Grace Skinner Baptist Memorial Hospital, Memphis, Tenn.
Second Vice-President	Alice Little Methodist Hospital, Memphis, Tenn.
Secretary-Treasurer	Jewelle C. Fink Physicians & Surgeons Bldg., Memphis, Tenn.
Historian	Bettie J. Gilmore Gartley-Ramsay Hospital, Memphis, Tenn.
Trustees	Lucy Gaffeney — Ada Hemsley Ruthie E. Hawne — Alice Little Ethel Sellers

TEXAS.

The fifth annual meeting of the Texas Association of Nurse Anesthetists was held at the Gunter Hotel, San Antonio, Texas, on February 23rd and 24th, 1940, in conjunction with the Texas Hospital Association.

The following papers were read:

"Anesthesia for Cesarean Section"
Elva J. Vetesk, Texarkana Hospital, Texarkana, Tex.

"Positions and Relaxation"
Madge M. Teague, Parkland Hospital, Dallas, Tex.

"Anesthesia for Surgery of the Upper Abdomen"
G. V. Brindley, M. D., Scott and White Clinic, Temple, Tex.

"The Choice of Anesthesia"
Francisco del Rio y Canedo, M. D., San Antonio, Tex.

Dr. Talbot W. Foster, of San Antonio discussed the subject of dental anesthesia, and Miss Osa Beck conducted an interesting round table discussion.

A banquet was held with the Texas Hospital Association at the Gunter Hotel, and visits were made to the clinics at Santa Rosa Hospital, Medical and Surgical Hospital, Nix Hospital, Robert B. Green Hospital and the Mexican Clinic.

Osa Beck, President

The sixth annual meeting will be held in Galveston, February 27th and 28th, 1941.

Officers Elected for 1940:

President
Osa Beck
Medical and Surgical Clinic, San Angelo

Vice-President
Minnie V. Haas
St. Joseph's Hospital, Fort Worth

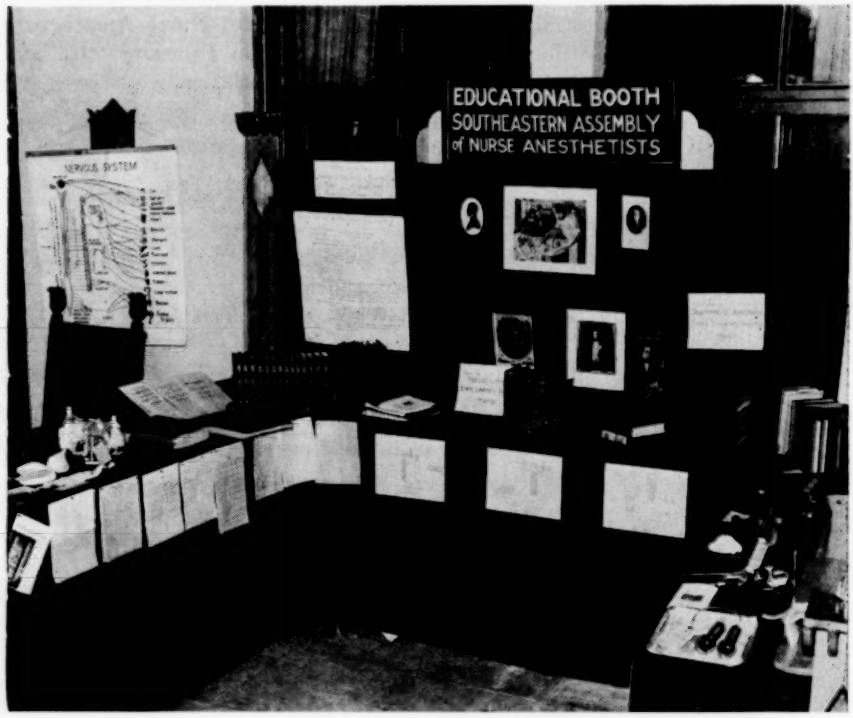
Secretary-Treasurer
Mrs. Jack Childress
Scott and White Hospital, Temple

Trustee:
Vergie E. Rape
Hemlock Memorial Hospital, Abilene

WASHINGTON

The first annual meeting of the Washington Association of Nurse Anesthetists will be held in Spokane, May 17th and 18th, 1940, in conjunction with the Washington Hospital Association.

For further information write Mrs. Mildred Peterson, Secretary, 705 Broadway, Seattle, Wash.



Educational Booth at Southeastern Meeting

SOUTHEASTERN ASSEMBLY OF NURSE ANESTHETISTS

The second annual meeting of the Southeastern Assembly of Nurse Anesthetists was held March 28-29, 1940, at Edgewater Park, Miss., in conjunction with the Southeastern Hospital Conference. The Edgewater Gulf Hotel, where the meeting was held, faces the Gulf of Mexico, and the green lawns, gorgeous flowers and balmy spring air were added attractions, particularly to those of us who had left home during one of the worst snow storms of the season. To emphasize again this contrast, we were greeted with huge bouquets of pansies, red bud and azaleas gathered from the nearby gardens, placed in our rooms and used as decorations throughout the hotel.

The meeting was called to order on Thursday morning by Mrs. Rosalie C. McDonald, President. Mrs. McDonald must have been very busy for weeks before the meeting but the climax came during those two full days. She could be seen at any time during the hours from 6:00 a.m. until well on into the evening, making the last minute arrangements or calling together various committees to take care of the business of the Association. She had many loyal helpers, among whom was Miss Anne Beddow. Miss Beddow with her committee planned a program that proved both extremely interesting and instructive.

It would be utterly impossible in the space allotted to give a detailed report of the scientific meetings. Most of the papers will be published in this

or one of the regular publications. It is interesting, however, to note the number of subjects covered in the two-day session, as follows:

"The Anesthetists' Part in Hospital Public Relations"
Mr. Alden B. Mills, Managing Editor, Modern Hospital

"Anesthesia in Surgery of the Heart"
Gertrude L. Fife, Director, School of Anesthesia,
The University Hospitals of Cleveland

"Charting the Signs of Anesthesia"
Alpha Schier, St. Joseph's Infirmary, Atlanta, Ga.

"Information Please"
Esther C. Myers, Director of Education, School of Anesthesia,
Charity Hospital, New Orleans

"The Value of the Nurse Anesthetist from the Viewpoint of a Hospital Executive"
Henry Boswell, M.D., Superintendent, Mississippi Sanatorium,
Sanatorium, Miss.

"Pentothal Sodium-Oxygen Anesthesia in General Surgery"
Fred Rudder, M.D., Atlanta, Ga.

"Pentothal Sodium Anesthesia in Orthopedic Surgery"
Jean O'Brien, Willis C. Campbell Clinic, Memphis, Tenn.

"The March of Time in Anesthesia"
Emma Easterling, Jackson Memorial Hospital, Miami, Fla.

"Obstetrical Anesthesia and Analgesia"
Lydia Yancey, Supervisor, Obstetrical Division,
Charity Hospital, New Orleans

"Anoxia"
Chapman Reynolds, M.D., Professor of Pharmacology,
Louisiana State University Medical School, New Orleans

"An Analysis of Postanesthetic Mortality and Morbidity"
Charles B. Odom, M.D., Assistant Director,
Charity Hospital, New Orleans

"Anesthesia Service in the Small Hospital"
(read at the joint session with the Southeastern Hospital Conference)
Gertrude L. Fife, Director, School of Anesthesia
The University Hospitals of Cleveland

Officers Elected:

President	Esther C. Myers Charity Hospital, New Orleans, La.
Secretary-Treasurer	Ida Tedford Ellis 1210 Kuhl Avenue, Orlando, Fla.

Miss Helen Lamb, of Barnes Hospital, St. Louis, Mo., who also attended the meeting, reported an instance of the ignition of cyclopropane at Barnes Hospital, pointing out a new source of danger and recommending certain precautions heretofore unpublished.

The social activities included a luncheon and dinner arranged for the

SOUTHEASTERN ASSEMBLY (continued)

group by the Mississippi anesthetists, and the joint banquet and dance with the Hospital Conference.

This report would not be complete unless some mention were made of the attendance from outside the Southeastern Conference. At least twelve anesthetists from Tennessee, as well as one from Arkansas and one from Texas, were present. The Tennessee anesthetists met for breakfast on Friday morning and I had the good fortune to have been invited to attend.

At the close of the meeting we left our friends saying that we would see them in Boston next fall, or in Memphis next Friday, or at various other meetings, only to arrive in New Orleans and see many familiar faces—in fact it appeared as though practically the whole convention group proceeded to that city as a postconvention relaxation to enjoy a bit of Old World atmosphere.

Next year the meeting will be held in New Orleans and I hope that anyone who can possibly attend will not miss the opportunity. I consider it a privilege and an honor to have been a guest of the Southeastern Conference and I wish to express my thanks to Dr. A. M. McCarthy, President of the Southeastern Hospital Conference, and to the anesthetists, for having made my attendance possible.

Gertrude L. Fife

PROGRAM

JOINT MEETING, ANESTHETISTS OF ILLINOIS, INDIANA AND MICHIGAN

With Tri-State Hospital Assembly

Stevens Hotel, Chicago, Ill.

MAY 1st and 2nd, 1940

Wednesday, May 1

GENERAL SESSION — 2:00-4:15 p.m.

Presiding — Nelle G. Vincent
Evanston Hospital, Evanston, Ill.

Greetings from the Tri-State Hospital Assembly
Malcolm T. MacEachern, M.D.,
Associate Director, American College of Surgeons

Greetings from the American Association of Nurse Anesthetists
Anna Willenborg, Executive Secretary

"Anesthesia for Infants and Children During Plastic Surgery"
Esther Mason
Blodgett Memorial Hospital, Grand Rapids, Mich.

"Physiology of Respiration"
Hans O. Haterius, D.M., Associate Professor of Physiology,
Wayne University College of Medicine, Detroit, Mich.

"Carbon Dioxide Ventilation Postoperatively"
Anna M. Ronn, Passavant Memorial Hospital, Chicago, Ill.

TRI-STATE (continued)

"The Use of Helium in Anesthesia"
Albert C. Mueller, M.D., Medical Director,
Department of Physical Medicine, St. John's Hospital,
Springfield, Ill.

"Intratracheal Anesthesia"
Charles J. Betlach, M.D., Director, Department of Anesthesia,
Cook County Hospital, Chicago, Ill.

BUSINESS SESSIONS — 4:15-5:30 p.m.

Illinois State Association of Nurse Anesthetists
Indiana State Association of Nurse Anesthetists
Michigan State Association of Nurse Anesthetists

Anesthesia problems discussed.

Thursday, May 2

8:00 - 11:00 a.m. Clinics at various hospitals

12:15 - 2:00 p.m. Joint Luncheon Meeting of the Illinois, Indiana and Michigan Association of Nurse Anesthetists

Address—"Medicine Looks Ahead"
Austin A. Hayden, M.D., Secretary, Board of Trustees,
American Medical Association

7:00 p.m. Tri-State Hospital Assembly Banquet
A most cordial invitation to the Banquet is extended to

GENERAL SESSION 2:15-4:15 p.m.

Presiding—Mabel Elizabeth Courtney, Grace Hospital, Detroit, Mich.
President, Michigan Association of Nurse Anesthetists

"Oxygen Therapy"
M. Herbert Barker, M.D., Assistant Professor, Department of Medicine,
Northwestern University Medical School, Chicago, Ill.

"Status Lymphaticus"
Clarence I. Owen, M.D., Director of Laboratories,
Grace Hospital, Detroit, Mich.

"Ethylene and Its Advantages"
Ethel M. Moir, Henry Ford Hospital, Detroit, Mich.

"Progress in the Prevention of Explosion Hazards"
Warren P. Morrill, M.D.,
American Hospital Association, Chicago, Ill.

"Wanted—a Nurse Anesthetist"
Anna L. Tittman, Executive Director,
Nurse Placement Service, Chicago, Ill.

Round Table—Conducted by Anna Willenborg, Executive Secretary,
American Association of Nurse Anesthetists

7:30 - 10:00 p.m. Departmental Panel Round Table Conference for all Groups and Sections of the Tri-State Hospital Assembly.

A cordial invitation to the Banquet is extended to
all anesthetists attending the meeting.

PROGRAM

NINTH ANNUAL MEETING

PENNSYLVANIA ASSOCIATION OF NURSE ANESTHETISTS

May 8-10, 1940

Held in conjunction with the Hospital Association of Pennsylvania
William Penn Hotel, Pittsburgh, Pa.

Wednesday, May 8

Registration—17th floor Hotel William Penn
10:30 A.M. —Meeting of the Board of Trustees

GENERAL SESSION — 2:00 p.m.

Presiding—Gertrude Byers
Allegheny General Hospital, Pittsburgh, Pa.

Address of Welcome
Edith E. Abary, President
Pennsylvania Association of Nurse Anesthetists
Harrisburg Hospital, Harrisburg, Pa.

Greetings
Abraham Oseroff, President
Hospital Association of Pennsylvania
Director, Montefiore Hospital, Pittsburgh, Pa.

Greetings
Miriam B. Shupp, President
American Association of Nurse Anesthetists,
Strong Memorial Hospital, Rochester, N.Y.

"Anesthesia in Major Urological Surgery"
Philip A. Faix, M.D., F.I.C.A.,
Director of Anesthesia, Mercy Hospital,
Pittsburgh, Pa.

"Postanesthetic Complications in Major Urological Surgery"
Adeline E. Vogt, Mercy Hospital, Pittsburgh, Pa.

"Anesthesia in Obstetrics"
J. P. McComb, M.D., Chief Obstetrician
Shadyside Hospital, Pittsburgh, Pa.

"Spinal and Avertin Anesthesia"
O. M. Sell, M.D., F.I.C.A., Chief Anesthetist
Presbyterian & Women's Hospitals, Pittsburgh, Pa.

"Choice of Anesthesia for Operations about the Face and Neck"
Robert L. Patterson, M.D., F. I. C. A.,
Director of Anesthesia, Allegheny General Hospital,
Pittsburgh, Pa.

Moving Picture—"Intravenous Anesthesia"

Thursday, May 9

8:30-10:00 a.m. Clinic—St. Francis Hospital, 45th Street, Pittsburgh

PENNSYLVANIA (continued)
Thursday, May 9, (continued)

GENERAL SESSION

11:15 a.m. Demonstration of the Combustibility of Various Gases
David Labowitz, Ph. G.

11:30 Discussion and Demonstration of the Applicability of Intravenous Solutions
R. F. McGrew, Ph. G.

12:30 p.m. Luncheon—William Penn Hotel

GENERAL SESSION—1:30 p.m.

Presiding—Margaret J. Newcomer
St. Francis Hospital, Pittsburgh, Pa.

Address
W. S. McEllroy, M.D.
Dean, School of Medicine, University of Pittsburgh.

"Anesthesia in Thoracic Surgery"
H. Ryerson Decker, M.D., F.A.C.S.
Presbyterian and Women's Hospitals,
Tuberculosis League, Pittsburgh

"Causes of Anesthetic Deaths and Their Prevention"
George J. Thomas, M.D.
Instructor of Anesthesia, University of Pittsburgh,
School of Medicine

"Anesthesia in Surgery of the Heart"
Gertrude L. Fife
Director, School of Anesthesia
University Hospitals of Cleveland

"Spinal Anesthesia"
E. W. Rebbeck, M.D.
Shadyside Hospital, Pittsburgh, Pa.

"Nitrous Oxide-Oxygen Anesthesia in Dental Surgery"
J. Earl Remlinger, Jr., M.D.
Director of Anesthesia, St. John's Hospital, Pittsburgh

Presentation of Awards to Student Anesthetists for Prize Winning Essays on Anesthesia

First Prize—$10.00—given by Miss Hilda R. Salomon
Chief Anesthetist,
Jewish Hospital, Philadelphia

Second Prize—$5.00—given by the Pennsylvania Association of Nurse Anesthetists

BUSINESS MEETING

Presiding—Edith E. Abary, President

Reports
President
Secretary-Treasurer
Committees

PENNSYLVANIA (continued)
Thursday, May 9, (continued)

Election of Officers
Introduction of New Officers
New Business

7:00 p.m. Annual Banquet—William Penn Hotel
Sponsored by the Hospital Association of Pennsylvania

EIGHTH ANNUAL MEETING

AMERICAN ASSOCIATION OF NURSE ANESTHETISTS

Boston, Massachusetts, September 16-19, 1940

The Hotel Touraine, convention headquarters, is located on Tremont Street at Boylston, within easy walking distance of the shopping district, leading theaters, and transportation facilities. All bedrooms are large, with outside exposure, table radios provided on request without charge.

Rates: Single rooms $3.50 to $5.50; double rooms $5.00 to $7.00, or with twin beds $5.50 to $7.50; extra guest in room, with day-bed, $1.50 daily.

Make your reservations early.

Program and Convention Arrangements Committee

Gertrude M. Gerrard, Chairman
Peter Bent Brigham Hospital, Boston, Mass.
Elizabeth R. Farrell, Massachusetts General Hospital, Boston
Margaret Lyons, Massachusetts General Hospital, Boston
Betty E. Lank, Children's Hospital, Boston
Elizabeth F. MacRae, Peter Bent Brigham Hospital, Boston
Marion Smith, Newton Hospital, Newton, Mass.

MID-WEST NURSE ANESTHETISTS' ASSEMBLY ORGANIZED

During the latter part of 1939, the Mid-West Hospital Association invited the nurse anesthetists in the states comprising this group—Arkansas, Colorado, Kansas, Missouri and Oklahoma, to hold their annual meetings concurrently with them. The invitation was accepted and the first meeting was held April 11, 1940 at the Continental Hotel, Kansas City, Mo., and the organization of this group of states effected.

Mrs. Rosalie McDonald, first President of the Southeastern Nurse Anesthetists' Assembly, who had done such a splendid piece of work in organizing that Assembly, was present and assisted with the organization of this group. It was also the privilege of your President to be present at this meeting.

Each of the five states in the group was represented and a total of twenty-three members participated in the organization of the Mid-West Nurse Anesthetists' Assembly. The officers elected were: President, Ann Cox, Missouri Baptist Hospital, St. Louis, Mo.; Secretary-Treasurer, Edith Marcum, Jewish Hospital, St. Louis, Mo. A set of standing rules was adopted as the governing rules of the body, one being that the Presidents in the organized states and representatives from the two states as yet unorganized shall constitute the Executive Committee.

A luncheon was held at the Continental Hotel following the organization meeting, with thirty-five members in attendance. The President of the American Association of Nurse Anesthetists was the guest speaker. Miss Edith Marcum of St. Louis participated in the afternoon program of the Mid-West Hospital Association, her subject being "Telling the Public." Miss Ethel F. Currie of Denver, Colo., gave the nurse anesthetists' group a most interesting talk on the differences and difficulties of anesthesia in high altitudes. This was followed by an informal and most instructive round table discussion conducted by Sister M. Cyrilla.

The Missouri State Association held their annual meeting following the program and the newly elected officers and executive committee of the Mid-West Nurse Anesthetists' Assembly met to discuss plans for the coming year. The hospital banquet to which the nurse anesthetists were invited, ended a busy day.

Our hats are off to Miss Jessie Lindsay, immediate Past-President of the Missouri State Association, and her co-workers for putting through this splendid piece of organization work. The American Association of Nurse Anesthetists is also most appreciative of the interest of the Mid-West Hospital Association in the nurse anesthetists and for its co-operation and support to the group.

The interstate groups now organized are: the Mid-South Post Graduate Nurse Anesthetists' Assembly, the Southeastern Nurse Anesthetists' Assembly, and the Mid-West Nurse Anesthetists' Assembly, and in May when the nurse anesthetists of the Tri-State and Michigan meet with these hospital associations for their first meeting, we will undoubtedly see the organization of this group.

MIRIAM G. SHUPP, President
American Association of Nurse Anesthetists

COMING MEETINGS

Minnesota	Sixth annual meeting in conjunction with the Minnesota Hospital Association, Minneapolis, Minn., May 23-25, 1940.
New York	Seventh annual meeting, Hotel New Yorker, New York City, May 22-24, 1940.
Pennsylvania	Ninth annual meeting, May 8-10,1940, Pittsburgh, Pa., in conjunction with Hospital Association of Pennsylvania.
Washington	First annual meeting, May 17-18, 1940, Spokane, Washington, in conjunction with the Washington Hospital Association.
Wisconsin	Annual meeting, November 9, 1940.
American Association of Nurse Anesthetists	Eighth annual meeting, September 16-19, 1940, Boston, Mass., in conjunction with American Hospital Association.

In Memoriam

Miss Georgia M. Maxwell, formerly of the Methodist Episcopal Hospital, Scottsbluff, Nebr. and later employed at Queen's Hospital, and at Kapiolani Hospital, Honolulu, Hawaii, passed away August 2, 1939. She had been a member of the American Association of Nurse Anesthetists since 1935.

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FORM OF BEQUEST OR CONTRIBUTION

In response to inquiries reaching the headquarters of the American Association of Nurse Anesthetists the following form is suggested as a proper one to follow:

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All income from the Fund known as the American Association of Nurse Anesthetists' Trust Fund will be used for the aged and indigent nurse anesthetists who qualify for participation in the benefits of said fund as stated in Trust Fund Document.

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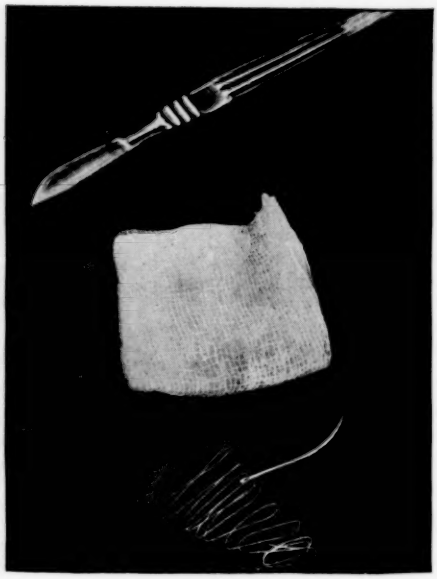
Date..... .....



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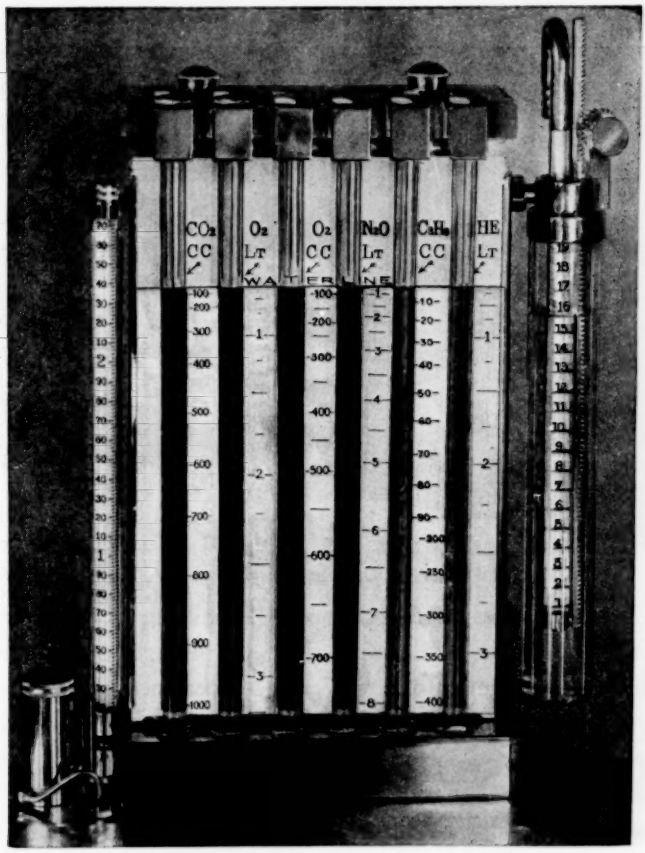

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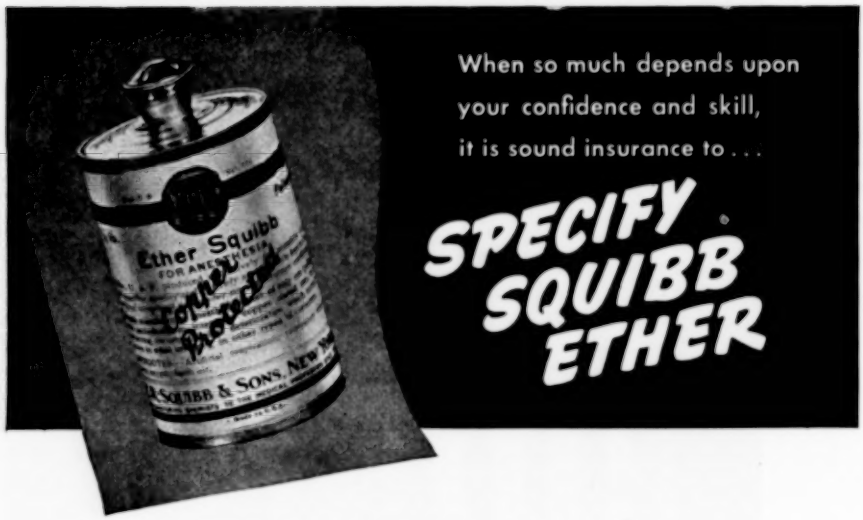

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